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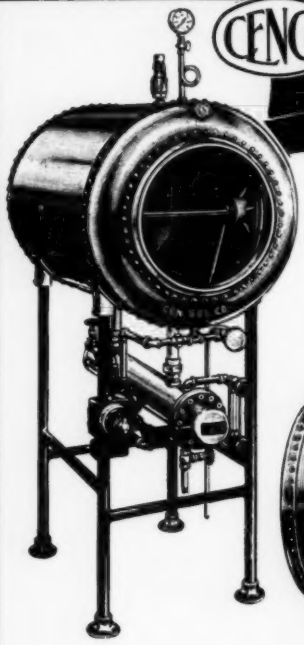

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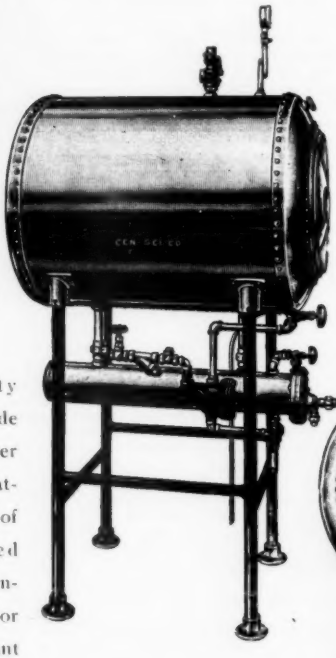

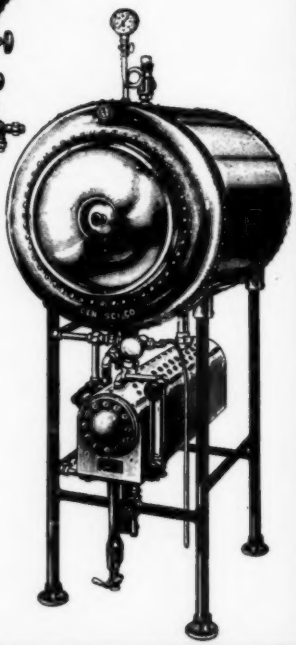

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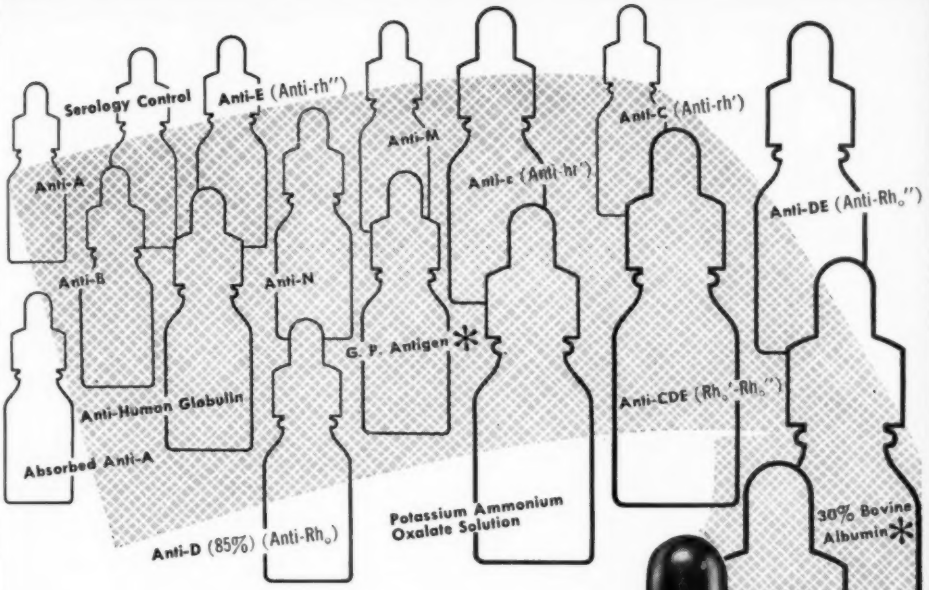

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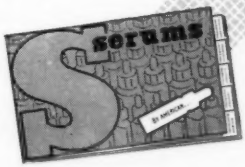

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(In requesting information concerning these appointments, we shall appreciate your mentioning key numbers.)

BURNEICE LARSON

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The
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VOLUME 16 SEPTEMBER, 1950 NUMBER 5

THE VALUE OF PHOTOMICROGRAPHY IN THE STUDY OF HEMATOLOGY *

SISTER MARY LEO RITA VOLK, S.S.M., M.S., in M.T. (A.S.C.P.)
St. Mary's Hospital, St. Louis, Missouri

Interest in Hematology is rapidly increasing and as a very important branch of medicine it can be both fascinating and intriguing. However, from the viewpoint of the technologist there are certain fundamental principles to be followed and certain techniques to be mastered in order to produce consistently accurate results. Marked precision and attention to minute details are necessities. These labors are, however, rewarded by the increased interest which the field will then provoke. With these thoughts in mind, we thought it would be well to consider some of these basic requirements.

Methods and Materials

A good blood smear necessitates the use of clean, grease-free slides. Slides may be satisfactorily prepared by washing in Calgonite, or some other cleansing agent, rinsing well in tap water, then in distilled water, and finally drying with a lint-free cloth after having dipped them in 95% alcohol. New slides are, of course, preferred but at least the "spreader" should have a perfect edge. In the event a perfect edge slide is not available, the hemocytometer coverglass makes an excellent "spreader." The ideal smear is margin-free, of one-cell thickness with the feather-edge ending on the slide. The area near the feather-edge usually shows a higher concentration of nucleated cells and it is suitable for a quick study of cell morphology. However, since the distribution of cell types varies in different areas of the smear, the differential count should be made by observing the

* 2nd Award, Annual Convention, American Society Medical Technologists, Houston, Texas, June, 1950.

smear completely from side to side at four different points along the smear between the base and the feather-edge.

Direct Smears

Direct smears from a finger prick are perhaps best for study of cell morphology, but anticoagulated venous blood is used quite extensively. In the use of venous blood, however, the time element between drawing the blood and making the smears is quite important as the cells tend to disintegrate, phagocytize crystals, and are, in general, unsatisfactory if not made within approximately thirty minutes.

Anticoagulants

Anticoagulants commonly used are heparin, potassium oxalate, sodium citrate, and the Wintrobe anticoagulant which, when dissolved, gives an isotonic solution. This is a mixture of ammonium oxalate and potassium oxalate — the former causing a swelling of the cells, and the latter a shrinkage — so prepared that they equalize each other thus giving an isotonic solution.*

Heparin is perhaps the anticoagulant of choice, but it is a little expensive for routine use. We do, however, use it for all bone marrow studies and prefer the dried powdered heparin to the liquid, because of the dilution factor involved in the latter.

The Concentrated Smear

In addition to making direct smears, it is often desirable, or necessary, to make smears of the concentrated nucleated cells, or buffy coat as it is properly known. Well mixed anticoagulated blood is placed in a hematocrit, or similar tube and centrifuged at high speed for a short period of time. For uniform results we centrifuge three (3) minutes at 3000 rpm. Again, the time element is very important. After centrifuging, the greater part of the plasma is withdrawn, *the entire buffy coat* is aspirated off of the erythrocytic layer and placed in a watch glass or on a slide and *mixed gently but thoroughly*. We usually place ours on one slide and mix with the end of another slide. Removal of the entire buffy coat and thorough mixing are essential for the proper distribution of all cell types, as they tend to fall in layers according to their specific gravities. Excellent slides can be made by dipping into the material each time and making the smear immediately rather than by placing individual drops on a slide and then spreading. Coverslip preparations can also be made if desired. The slides are then properly labeled. The name and date can be written with ink at once into the thick end of the smear — thus avoiding any possible identification error.

Concentrated or buffy coat smears are of value in many instances because they give, at a glance, so much more than does

* Wintrobe anticoagulent: Dissolve 1.2 gm. ammonium oxalate and 0.8 gm. potassium oxalate in 100 cc. distilled H_2O. 0.1 cc. per 1 cc. blood is measured into tubes and evaporated to dryness.

an ordinary direct preparation. They are of particular value in cases where the nucleated cell count is very low, for example, in aplastic anemias and agranulocytosis. Differentials can be done on these preparations, and because it is much less time consuming to count an adequate number of cells, it is of advantage. However, the direct smear in each instance should be carefully examined to determine whether the general distribution of cell types is the same as in the concentrated smear.

Then, too, they are of value in peripheral blood studies of anemias, enabling the technologist to detect the nucleated red cells which might be overlooked in the ordinary direct smear. In leukemias — particularly aleukemic types, in infectious mononucleosis and other diseases giving characteristic pictures, and in cases of malaria, the parasites stand out especially well in concentrated smears, so much so that we prefer this method to the standard "thick drop" method in cases of suspected malaria.

Concentrated smears should also be made on all bone marrow studies. They are of diagnostic importance in at least one disease — that of lupus erythematosis — where the L.E. cell phenomenon is found only in centrifuged preparations.

Standardized Blood Stain

Many blood stains are in common use today. Wright's, Kingsley, Giemsa, Wilson, and many other polychrome stains are used throughout the country. Like almost everyone else, we have our own modification of preparing the stain and Wilson is our stain of choice. We standardize our stain so that we can duplicate the exact concentration. As is commonly known, powdered stain is hard to dissolve in methyl alcohol and one is never quite sure of a specific amount being dissolved. We have overcome this difficulty by using the following method:

Wilson Stain: 2 gms. are added slowly, and with shaking, to 1000 cc. absolute methyl alcohol (acetone free). This is set aside for several days, with occasional shaking. The solution is then filtered and standardization is carried out at this point. Place 10 cc. distilled H_2O in a test tube and add 5 drops of stain from a 1 cc. pipette. Mix well and read in a 12 x 75 cm. cuvette on the Junior Coleman Spectrophotometer at a wavelength of 560 mu, using distilled water as a blank. The wavelength was arbitrarily chosen and a reading of thirty-five (35) should be approximated. If the stain is too strong — indicated by a lower reading — methyl alcohol is added to the stain and again mixed thoroughly. If the stain is too weak, a concentrated mixture is prepared and filtered into the solution. Repeated tests are run until the desired concentration is reached. Readings can be taken

in a colorimeter; however, we found this to be not too accurate and it also involved the necessity of having a "standard." Once a standard has been read in any type photoelectric instrument, the reading can always be duplicated.

The timing usually remains fairly constant: one volume stain is placed on slide for one (1) minute to allow for "fixing" after which twice the amount of buffer is added, mixed by blowing until metallic sheen appears and then timing for four (4) minutes. However, in rare instances such as plasmacytic leukemia, or some other blood dyscrasia, one may have to resort to experimental timing.

In diluting the stain, distilled water may be used, but a buffer solution pH 6.4 is preferred. A convenient method of preparing buffer solution is to dissolve 1 Coleman Buffer Tablet**, pH 6.4 in 2000 cc. distilled H_2O.

Principle of Staining

Acid and basic dyes are mutually antagonistic — they being coulombic in nature.[1] In order for them to act, they must form a molecularly balanced neutral compound which is insoluble in water and which, therefore, must be employed in alcoholic solutions. The actual staining depends on the hydrolytic splitting of the compound. This is produced by water or preferably a buffered solution being added to the concentrated stain on a blood smear. The concentrated stain containing methyl alcohol merely acts as a fixative, the actual staining occurs when the buffer is added. The amount of buffer added to promote dissociation must be the maximum amount consistent with retaining the dye in solution, otherwise precipitation occurs and the result is a badly stained slide. This is another very good reason for standardizing the stain so that a known quantity of buffer can be added each time.

Blood cell staining is based upon the affinity of dyestuffs for special chemical grouping of substances. For example, basic dyestuffs, such as methylene blue, or brilliant cresyl blue, carrying positive charges, appear to stain acidic substances carrying negative charges such as the phosphoric acid groups in nucleic acid, or the half-sulfuric acid ester groups of heparin. Acidic dyes, such as eosin, with negatively charged groups, tend to combine with positively charged groups like those of histones or globins. The affinity of hemoglobin for acidic dyes, too, is enhanced by the high iso-electric point of the globin fraction of the molecule.

Chemical cytology is rapidly advancing and the chemical and functional activities of cells as revealed by histologic staining methods will characterize and differentiate various kinds of

** Coleman Certified Buffer Tablets — Coleman Electir Co., Maywood, Ill., (Aloes).

cellular lipids, proteins, carbohydrates, acid and alkaline phosphatases, enzymes, and inorganic substances into their respective categories.

Other stains commonly used in Hematology are the peroxidase stains — to differentiate cells of the granulocytic series from those of the non-granulocytic types. Brilliant cresyl blue for reticulocyte studies, Manson's stain for lead stippling and the supra-vital stains, such as Neutral red, Janus green, Sudan III, Sudan black B, and Nile blue, among others, to study the living cells.

Other ways of exploring cellular activity are by means of poralized light, ultra-violet light, X-ray diffraction spectra, and the electron microscope. With the advent of new nuclear and cytoplasmic staining techniques, Hematology may be revolutionized and, just as bacteriology has been profoundly changed by the introduction of all the new antibiotics, so too, the time may come when blood cells may be identified as to their nucleoprotein, desoxyribonucleoprotein, or muco-polysaccharide content or ribo-nuclear pattern.

Terminology

A review of the recommended nomenclature of cells of the blood and blood forming elements has been presented on several occasions. Margret E. Hughes of the University of Oregon, has presented papers at the last two A.S.M.T. conventions and reprints [3] of her very excellent papers are available; I shall not attempt to go into the proposed terminology at any great length.

Hematological nomenclature is greatly in need of standardization, and this is the most recent attempt that has been made in this direction. A committee of Hematologists met in a series of round-table conferences to discuss, evaluate, and determine which were the best and most suitable terms to use. This group is sponsored by the A.S.C.P., and the A.M.A. There has not been complete acceptance of the proposed and recommended terminology; there are those who think that either confusion

RECOMMENDED TERMS

Table I

Terms to be Used	Terms to be Avoided
LYMPHOCYTIC	Lymphoid, lymphatic, lymphogenous, lymphocyte, mononuclear
GRANULOCYTIC	Myeloid, myelogenous, myelocyte, myelocytic, granulocytic, leukocytic, leucocytic
MONOCYTIC	Monocytoid, monocytogenous, mononuclear
PLASMACYTIC	Plasma cellular, plasmacytogenous
THROMBOCYTIC	Mega karyocytic, platelet, thrombocyte
ERYTHROCYTIC	Erythroid, erythrocytoid, erythron, erythrocytogenous

does not exist and there is no need for clarification, or that the time for doing so is not now, but at some indefinite future date when more exact knowledge has been accumulated. The objections to the recommended terminology have been sincere but no one, yet has suggested alternative terms which would be accepted by a majority of hematologists.

Table II

Name of Series	Term to be Used	Terms to be Avoided
Granulocytic	MYELOBLAST	Granuloblast, hemocytoblast, lymphoidocyte, lymphocyte, stem cell
	PROGRANULOCYTE	Promyelocyte, leukoblast, myeloblast, premyelocyte, promyelocyte, progranulocyte A
	MYELOCYTE	Granulocyte, myelocyte B, non-filament I
	METAMYELOCYTE	Meta granulocyte, juvenile, non-filament, class I
	BAND CELL	Staff cell, stab cell, non-filament, class I rod nuclear, polymorphunuclear, stabkernige, rhabdocyte, non-segmented
	SEGMENTED CELL	Polymorphunuclear, filamented, class II, III, IV, or V, labocyte
	DISINTEGRATED CELL	Smudge cell, basket cell, senile cell, degenerated cell
Lymphocytic	LYMPHOBLAST	Myeloblast, hemocytoblast, lymphoidocyte, stem cell, lymphocyte
	PROLYMPHOCYTE	Large lymphocyte, pathologic lymphocyte, atypical leukocytoid lymphocyte, monocyte, immature lymphocyte
	LYMPHOCYTE	Small, medium, or large lymphocyte, normal lymphocyte, small, medium, or large mononuclear
Monocytic	MONOBLAST	Myeloblast, hemocytoblast, lymphoidocyte, lymphocyte stem cell, immature monocyte
	PROMONOCYTE	Premonocyte, hemohistioblast, immature monocyte, Ferrata cell
	MONOCYTE	Large mononuclear, transitional, plasmatocyte, endothelial leukocyte, histiocyte, resting, wandering cell
Plasmacytic	PLASMABLAST	Myeloblast, hemocytoblast, lymphoidocyte, lymphocyte, stem cell, lymphoblastic-plasma cell, myeloma cell
	PROPLASMACYTE	Turk cell, Turk irritation form, myeloma myeloma cell
	PLASMACYTE	Plasma cell, Unna's plasma cell, Marchalko plasma cell, plasmacytoid, lymphocyte, myeloma cell
Thrombocytic	MEGAKARYOBLAST	Megalokaryoblast
	PROMEGAKARYOCYTE	Promegalokaryoblast
	MEGAKARYOCYTE	Megalokaryocyte
	THROMBOCYTE	Platelet, thromboplastid

One term will replace five or six now in general use. The Committee does not imply that each series has a separate line of development or stem cell. Two or more series may have a precursor in common, but to date this has not been unequivocally established.

There has been no great change in the stages of differentiation: the most immature form being the *-blast* stage, and then the *pro-* stage and the *-cyte* following. The granulocytiv series is the only one which varies somewhat from accustomed terminology.

The erythrocytic series provoked most of the criticism concerning the recommended terminology. After extensive discussion, the Committee concluded that none of the terms in current use could be accepted since no majority was in favor of any one set of terms.

The most difficult decision to reach was choosing the stem to describe the nucleated forms of the erythrocytic series. The Committee favored the Latin stem "rubri" since it is easy to pronounce, readily understood, and has been in use in many other medical terms. Many Hematologists, not on the Committee, have objected to this new term.

Table III

Name of Series	Term to be Used	Terms to be Avoided
Erythrocytic	RUBRIBLAST	Erythroblast, megaloblast, pronormoblast, normoblast, promegaloblast, stem cell, hemocytoblast, myeloblast, lymphoidocyte, karyoblast
	PRORUBRICYTE	Erythroblast, megaloblast, pronormoblast, normoblast, macronormoblast, macroblast, prokaryocyte
	RUBRICYTE (Basophilic / Polychromatic / Orthochromatic)	Normoblast, pronormoblast, erythroblast, karyocyte, polychromatophilic normoblast, macronormoblast
	METARUBRICYTE	Normoblast, erythroblast, metakaryocyte
	RETICULOCYTE	
	ERYTHROCYTE	Red blood cell, normocyte, erythroplastic, akaryocyte

The Committee based its classification almost entirely on nuclear changes. Many Hematologists feel that the profound physiological importance of the presence or absence of hemoglobin in the cytoplasm of the erythrocytic cells does not receive proper stress in this classification. The pattern of *-blast* for the most undifferentiated cell, *pro-* for the next stage, and *-cyte* for the mature form is recommended. The Committee states that the qualifying adjectives: basophilic, polychromatophilic, and orthochromatophilic may be used, but does not emphasize this as an important feature in the further differentiation of the cells.

The morphologic deviations from normal, as characteristically seen in pernicious anemia, are to be so designated by the descriptive, qualifying adjective "pernicious anemia type," which applies equally well to cell of both the erythrocytic and granulocytic series.

In August of this year, the International Society of Hematology will meet in England. We hope that this will bring a final international agreement acceptable to all with regard to Hematological Terminology.

Microphotography, especially in color, is becoming more and more an essential part in the teaching of hematology. This is particularly true where large groups are concerned. Most of our pictures were taken with a Bausch and Lomb camera at a magnification of 1125x on 3¼x4¼ film. The scope was equipped with apochromatic systems and a 3200° K. light was used. In our hands, the Ektachrome is the film of choice. More constant results are obtained, and the colors are truer and more consistent than with any other films. Ansco film gave a reddish background and Kodachrome, while very good, is not consistently good for hematological studies. The large size film has a double feature in that it can be used not only for projection before a group but also mounted in shadow boxes as a permanent exhibit.

Summary

1. Techniques for direct and concentrated smears are reviewed.
2. A new method of standardizing blood stain is described.
3. The principle of the staining reaction of blood cells, and their affinity for specific dyestuffs is discussed.

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THE TRYPSINIZED CELL METHOD FOR THE DETECTION OF INCOMPLETE ANTIBODIES

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The detection of incomplete antibodies has assumed an important role in the study of hemolytic anemias in the clinical laboratory. To the various immunologic technics for this study, Wheeler et al [1, 2] have recently refined a method for the demonstration of incomplete antibodies in serum, using partially trypsinized normal red blood cells. This method has proved valuable in the study of problems concerned with the Rh sensitization, virus agglutination and incomplete antibodies associated with acquired and congenital hemolytic anemias. It is the purpose of this presentation to bring to the technologists' attention the trypsinized red blood cell technic.

Since the initial descriptions of incomplete antibodies by Race,[3] Wiener [4] and Diamond and Ableson,[5] approximately six years ago, numerous methods for detection of this type of antibody have been described. The original blocking technic,[4] the conglutination test,[6] the slide test,[7] the albumin test [8] and the Coombs'[9, 10] or developing test[11] have been among the more widely used of the methods described.

It had been noted that treatment of Rh-positive cells with certain viruses and V. cholerae filtrates would enable them to be agglutinated by incomplete anti-Rh sera.[12] Morton and Pickles [13] observed that crude trypsin produced the same effect, and that cells incubated with trypsin showed enhancement of agglutination with iso-agglutinins, immune agglutinins and the incomplete type of antibody. Wheeler [2] noted that partially enzyme treated normal red blood cells were directly agglutinated by incomplete serum antibodies in sensitized Rh-negative mothers. He found it to be a simple, sensitive, reliable, and inexpensive screening technic in the Rh phase of immuno-hematology. Abolishment of prozones in potent anti-Rh sera have also added to its value. Thus the establishment of a single tube screening technic, as well as a sensitive titration system, has been successfully accomplished. Wright, et al [14, 15] have applied the Wheeler technic, with slight modification, to the study of acquired and congenital hemolytic anemias. They have detected incomplete antibodies in both congenital and acquired anemias with both this method and the developing test (Coombs' test), thus disproving the effectiveness of the latter as a means of differentiating acquired and congenital hemolytic anemias. Rheins, et al [16] have shown that the trypsinized red blood cell technic enhances the hemagglutinating titer of mouse lung influenza virus preparations.

Methods of and Results of Study

I. The Trypsinized Red Blood Cell Technic

A. Trypsinization of Red Cells (Modified after Wheeler)

1) A 1% stock solution of trypsin is prepared from Difco 1:250 activity trypsin in buffered saline, pH 7.28, and filtered. (This solution will keep at refrigerator temperature for about a week, provided the flasks in which the solution is prepared and stored are sterilized.)
2) Test cells, 0, Rh-positive, are washed 3 times in cold normal saline.
3) To 1 cc of washed, packed cells is added 1.5 cc of a 0.1% trypsin prepared in buffered saline, pH 7.28, from the stock trypsin solution.
4) The suspension is incubated for 30 minutes at 37° C., with frequent agitation.
5) Centrifuge the suspension, remove the supernatant, and wash the cells 3 times with cold normal saline.
6) Prepare a 2% suspension of the treated cells in normal saline.
7) Check the cells for non-specific agglutination with normal sera.

B. Detection of Antibodies with Trypsinized Red Blood Cells.

1) 0.1 cc. amounts of the serum and its serial dilutions in saline are incubated with 0.07 cc of a 2% trypsinized cell suspension at room temperature for 5 minutes.
2) Tubes are centrifuged 1½ minutes at 1650 rpm.
3) The tubes are read microscopically for the degree of agglutination by gentle agitation. All readings are made in a strong light against a white background.

II. Studies of Certain Characteristics of the Trypsinized Red Blood Cell

A. Comparison of Agglutinability of Trypsinized Red Blood Cells.

Titrations were made against commercial anti-Rh_0 typing serum containing the incomplete type of antibody using various technics, the albumin method, the indirect developing test, and the trypsinized cell method. Comparison of the end points of these titers reveals an enhancement of the agglutinability of the test cells with the trypsinized cell method (Figure 1).

B. Effective Duration of Trypsinized Cells.

Another series of titrations were run to determine the *in vitro* usefulness of prepared trypsinized cells. Red blood cells were trypsinized and titered against commercial incomplete anti-Rh_0 typing sera on the day of preparation.

Figure 1
Comparison of the Agglutinability of Test Cells
Dilutions of Anti-Rh$_0$ Typing Sera

Medium	Cells	U	2	4	8	16	32	64	128	256	512	Cont
Saline.....	Normal	—	—	—	—	—	—	—	—	—	—	—
Albumin...	Normal	S	S	S	††††	†††	††	†	—	—	—	—
Indir.												
Dev. Test..	Normal	S	S	S	††††	†††	††	†	—	—	—	—
Saline.....	Tryp.	S	S	S	S	S	††††	††	††	†	—	—

(S =Solid Clump).

The cells were then stored at 4° C. and the titration repeated each day for five days. The cell suspension was washed once each day before the titration was run. It was found that trypsinized cells may be kept for three days, after that time the cells begin to hemolyze and showed diminished titers and avidity. (Figure 2)

Figure 2
Effective Duration of Trypsinized Red Blood Cells
Dilutions of Incomplete Anti-Rh$_0$ Typing Sera

Interval	U	2	4	8	16	32	64	128	256	512	Cont.
Day of preparation	S	S	S	S	S	††††	†††	††	†	—	—
Second Day.....	S	S	S	S	S	††††	†††	††	†	—	—
Third Day.....	S	S	S	S	S	††††	†††	††	†	—	—
Fourth Day.....	S	S	S	S	††††	†††	††	†	—	—	—
Fifth Day.....	††††	††††	††††	††††	†††	††	†	—	—	—	—

Discussion and Conclusions

The reliability of the trypsinized red blood cell test in clinical investigations of hemolytic anemias has been established by Wheeler, Wright and their associates. The details of this technic were made available to the author during the study of a series of Rh-negative pregnant women.[17] In two instances of Rh-negative women having erythroblastotic stillbirths, trypsinized red blood cell titers of 1:512 were found. Titrations with untreated red blood cells and saline dilutions of the sera were negative.

The test is a supplement to and not a replacement of existing technics. The advantage of simple execution, requiring a single chemical reagent, along with definitive and easily read end points enhances its value. In the preparation of the trypsinized red blood cells caution must be taken to avoid overtrypsinization of the test cells which causes autoagglutination. This can be avoided by careful timing and normal sera control. When using this technic for the detection of Rh antibodies, tripsinized 0 Rh negative test cells should be included as a control. Since the effective usefulness of trypsinized cells is three days, preparation only twice weekly is necessary.

These many advantages of the trypsinized red blood cell method — accuracy, ease of performance and reading, higher titers, elimination of prozones and economy — recommend its adoption as part of the routine for the study of antibodies associated with hemolytic anemias.

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A METHOD FOR THE QUANTITATIVE ESTIMATION OF AMYLASE IN BODY FLUIDS OTHER THAN BLOOD SERUM*

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Because of the increase in pancreatic surgery, more attention is being focused on the estimation of amylase activity which has become a routine procedure in this and other clinical laboratories. However, this laboratory is called upon, occasionally, to make quantitative estimations of amylase activity on fluids other than blood serum. Specimens may consist of abdominal drainage following surgery that involves the pancreas, chest fluid, joint fluid, pancreatic secretion and other fluids. For blood serum amylase estimation we are using a two-tube modification of the procedure of Somogyi.[1] Using this procedure, cloudy filtrates were obtained on those fluids of low protein contents, making it necessary to modify our technic as described below.

Method

Reagents:

1. **Sodium Tungstate, 6%.** Dissolve 6 gms. of sodium tungstate, C. P., and dilute to 100 cc. with distilled water.
2. **Copper Sulfate, 5%.** Dissolve 5 gms. of $C_uSO_{4.5}H_2O$, C. P. and dilute to 100 cc. with distilled water.
3. **Starch Solution 1.5%.** Grind 15 gms. of dried soluble starch into a paste with 50 cc. of distilled water. Transfer the starch paste to 950 cc. of boiling water and boil for 30 minutes. Cover the container to minimize evaporation. Allow to cool and dilute to 1,000 cc. with distilled water. This solution will keep for several months if stored in a refrigerator. Just before use, a small portion of about 40 cc. is placed in a flask, glass beads are added, and the solution boiled for one minute. Cool and add water to readjust the volume to 40 cc.

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NUTRITIONAL BLOOD DYSCRASIAS

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Not only do diseases of various kinds cause blood abnormalities. The food which we eat and the food we don't eat can cause serious disorders oftentimes overlooked. Whereas one can find a leukocytosis with an acute case of appendicitis, the other extreme of leukopenia may follow a prolonged dosage of sulfadiazine. Whereas one can find a hemoglobin of 45% and a secondary anemia caused by a traumatic loss of blood, one can also find an equally low red blood count caused by insufficient iron available to the body.

The occurrence of nutritional deficiencies in the peoples of the world is alarming. The red cell picture is a relatively simple one, at least in theory if not correction. The type which we are concerned with here is caused by a decrease in blood formation resulting in an anemia. It may be the result of a deficiency in iron intake and utilization or an insufficiency of the erythrocyte maturing factor. Nutritional deficiencies may therefore cause insufficient red cell production for the very reason that the raw materials are not available to the bone marrow. The most important requirement, iron, has been estimated as being only 6 to 9 mg. daily. That small amount is normally obtained from an average diet and is supplemented by iron stored in the liver. However, many reasons can influence the availability of the iron to the body—faulty absorption, insufficient intake or storage. A milk diet will be found to be especially faulty because of its low iron content and also its low copper content. Copper acts as a catalyst to iron assimilation into hemoglobin and is consequently vital (Hart and associates, 1928, et seq.).

The role of the white cell has been viewed with greater respect with new developments in the field of medicine. Foreign agents to the body in the form of drugs, while very ably driving away bacterial invasion and infection, also have deleterious effects on the white blood cell. The prolonged and consistent dosage of so many of the new coal tar derivatives and synthetic and organic drugs can affect the counts as well as the bacteria, with leukopenia and granulocytopenia or agranulocytosis resulting.

In view of these many changes which have occurred, greater emphasis is now placed on the various nutritional agents to both prevent and cure the detrimental effects. In these studies it is not feasible to use human beings as clinical guinea pigs in the early experimental stages. First the drugs and curative factors must be tried on some living tissues, and more practically a mov-

ing, living animal. Among recent years the position of the lowly white rat has developed into one of invaluable importance in laboratory studies. It is of prime interest to us because of nutritional studies which find the rat a rapid means of studying growth and hematologic changes caused by dietary factors. Basic reasons for its popularity include low initial cost and large litters in breeding; the small amount of cage space required; variability of the dietary possibilities; rapid growth; and a comparative means for work done in other laboratories.

The procedure used in bleeding the rat for hematologic studies is far different from either larger laboratory animals or humans because the small amount of blood ranges between 6 to 7 cc. per 100 gm. body weight in total volume. The vein in the tail is the source of blood since it is large with few sensitive nerve endings. This large tail vein may either be punctured, or the tip of the tail may be amputated for a smooth flow of blood. A hyperemia is produced by dipping the entire tail in very warm water. Sluggish flow and rapid clotting may be prevented by moistening with saturated sodium citrated solution and wiping dry. A slight pressure on the tail will prevent excessive blood loss, while slight gentle stroking brings blood to the tip if necessary. After the blood samples are taken, dipping the tail first in cold water and then a solution of ferric chloride in alcohol or in a thrombin solution will stop the bleeding. This precaution must be taken because excessive bleeding or too frequent bleedings will produce an anemia and resulting reticulocytosis, and an inflammation of the tail from injury may produce leukocytosis. These would present misleading information. Sufficient blood may be obtained from the tail for complete blood counts using conventional hematological procedures. The Van Allen hematocrit method is used because of the small amount of blood required with this pipette; a 2% acetic acid solution is used for white counts; physiological saline is used for red counts; and an acid hematin method for hemoglobins read photoelectrically is used. Normal values differ from human normals, in that the red cell count averages 7-10 million per $mm.^3$ (the erythrocyte is microcytic), and the white cell count averages 12-15 thousand per $mm.^3$ Hematocrit ranges approximate human normals as do hemoglobin readings, while the total granulocyte count percent is 10-30-40, with 15 as average percent.

Of especial interest is the variation in the white blood cell picture. With the aforementioned discoveries in modern science of potent new drugs, invaluable in themselves, come also changes from the normal ranges which are sometimes overlooked. Not only do they cause severe anemias as we have observed, but the leukopenias and granulocytopenias. A prolonged use of such drugs as benzene, the organic arsenicals and gold salts, thiouracil,

and the other similar derivations may produce leukopenia. The sulfa compounds especially we have observed in their effects, and shall note effects of both preventative and curative materials.

In order to begin with a definite decrease in white cells, the rat is fed a synthetic diet containing 1% of the sulfa for 35 days to deplete, giving ample opportunity for the depression of cells to occur. At this time a total white count of 4,000/mm.^{3} and a granulocyte percent of 0-1% will have been reached. Supplements of varying levels of pteroyl glutamic acid, crude and purified liver extracts, liver powders, yeast extracts, and combinations of these are added to the diet in a measurable amount. Complete blood counts are performed at intervals for comparison to note the increases as the deficient animal improves. A definite critical point of 2.1 ug. folic acid daily serves as a basis for quantitative assay of a material. This critical point is the stage where the animal holds its own.

Not only are depleted rats used, but some diets have been formulated which include the 1% drug plus supplement from the beginning. The effect of this preventative is prolonged until in a longer period the counts will gradually decline giving proof to the toxicity of the drug in time. Consequently this shows that, although a high source of nutritional corrective factor is used, the drug may nevertheless show forth its detrimentative effects eventually. Therefore any of these drugs must be carefully controlled with the proportionate neutralizing factor as we may figuratively call it.

There are many sources of high vitamin materials which may be used in either preventing or alleviating or curing the blood abnormalities. Among these are the various natural materials and folic acid free and folic acid conjugates. The theory has been furthered that the pteroyl glutamic acid or folic acid supplies the factor needed for proper maturation of the red blood cell. This factor is also made available through the natural sources like liver extracts and powders, yeast extracts and the like.

Folic acid was the result of comparatively recent research in the field of vitamins. Its discovery paralleled that of the other vitamin B group in growth studies. Its specificity for certain bacterial growth provides a satisfactory quantitative method for determining potency of materials in that the amount of acid produced by the lactobacilli in controlled medium is directly proportional to the folic acid content.

As recent as 1938 Stokstad and Manning (J. B. C. 125:689, 1938) observed growth promoting effects not explained by the riboflavin present in the diet. Through the following years, workers in widespread laboratories named this unknown factor as: vitamin B_c, factor U, factors R and S, norite eluate factor, and vitamin M. At last the name of pteroyl glutamic acid or

folic acid was given. The discovery of this vitamin was the result of months and years of studies of growth and hematology. Diets for animals deficient or lacking in folic acid repeatedly showed retarded growth, loss of weight, and death, and the same altered blood picture. Repeatedly there was noted the anemia and granulocytopenia accompanying the poor growth until it was recognized that folic acid was not only a growth factor but also an anti-anemia factor. By using this vitamin, prevention of the abnormalities occurred.

The various sulfonamides have been fed at the 1% levels in synthetic, highly purified diets in our laboratories. Their effect on growth, mortality, and blood depression was noted. The blood dyscrasias due to sulfanilamide, sulfathiazole, and sulfadiazine are the severe leukopenia, granulocytopenia, and a moderate-to-severe anemia. These may be prevented or controlled by feeding folic acid, liver extract or powder, or dried yeast extract. Liver extract powder especially seems to be beneficial in its effects on growth and mortality, while folic acid both free and conjugated forms (as found in yeast extract or liver extract powder) are active in combating the blood dyscrasias.

Because it is thought that the soluble and insoluble sulfonamides may produce intestinal bacteriostasis, interfering with the bacterial synthesis of vitamins, namely folic acid, it is most important to supplement or perhaps replace this source of the pteroyl glutamic acid. It has been suggested that the use of these natural materials and folic acid may not only alleviate the folic acid deficiency caused by the drug inhibiting bacterial synthesis, but it may also be necessary because of an increased demand for folic acid in the presence of the various sulfonamides. This action of folic acid in the presence of the sulfonamides more detailed in explanation may be found in reports of our laboratories published in the September, 1947, volume of *Blood, the Journal of Hematology,* (vol. II, no. 5, 1947, pp. 440-450).

Thus in summary, we know that although many changes can cause variations in our blood because of improper and inadequate nutrition, endless research lightens the dark picture in its discoveries for the prevention and cure of undesired effects. Folic acid in its free and combined form is invaluable. "From the wealth of new information the abnormal picture of macrocytic anemia can be consistently reversed. For folic acid plays its basic role as one of the more fundamental molecules essential to normal metabolism of all cell types in bone marrows, and in young actively growing cells, and tissues generally. Its mode of action is concerned with accelerating the development of immature red blood cells and perhaps with metabolism of nucleic acid in these cells. By maintaining normal absorption from the gastrointestinal tract, it enhances assimilation of all

other elements vital to normal hematopoiesis," (From "Ferr. Liver with F. A." for Hematorule, P. O. 2160, published by Upjohn, 1948.)

ABSTRACT

THE CIRCULATING EOSINOPHIL COUNT

DIFFERENTIATION AND ENUMERATION OF EOSINOPHILS IN THE COUNTING CHAMBER WITH A GLYCOL STAIN: A VALUABLE TECHNIQUE IN APPRAISING ACTH DOSAGE. By Theron G. Randolph, M.D., Chicago, Illinois. Journal of Laboratory and Clinical Medicine 34:1696, (Dec.) 1949.

With the increasing importance of Acth in the diagnosis and treatment of various clinical conditions the author describes a simple and reliable technique for enumerating eosinophils, since the level of these cells in the peripheral blood may be a general guide for adequate dosage of Acth in treatment.

Materials and Method (Essentially verbatim)

Given amounts of stock solutions containing 0.1% methylene blue in propylene glycol and 0.1% phloxine in propylene glycol are each diluted with an equal volume of distilled water and placed in dropper bottles.

For example:

Solution I

0.1% methylene blue in propylene glycol....50.0 cc.
Distilled water .....50.0 cc.

Solution II

0.1% phloxine in propylene glycol.....50.0 cc.
Distilled water .....50.0 cc.

The final white blood cell diluting fluid is made by mixing an equal number of drops of Solution I and Solution II in a test tube, this remains usable for approximately four hours. Longer periods of standing impairs differential staining detail and precipitation of dyes may occur. Because of the varation in staining ability between lots of dyes, optimum acid and basic staining may sometimes be obtained by making a slight change in the relative proportions of Solution I and II in the final diluent.

Total and differential white blood cell counts are made using the standard pipette and counting chamber. The pipette is shaken during the course of and immediately after filling with the diluted fluid. A period of from 10-15 minutes is recommended for maximum staining of eosinophils.

Under the low magnification (16 mm. objective) eosinophils may be differentiated from other cells by their brilliant red color and slightly larger size. The colors are intensified by increasing the light. The eosinophils in one side of the counting chamber (0.9 c. mm.) or in the entire ruled areas of both sides of the chamber (1.8 c. mm.) are counted and multiplied, respectively, by 22 and 11 to obtain the number of eosinophils per cubic millimeter of blood.

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* From the Illinois Journal of Medical Technology, Vol. 12, No. 1.

PHOTOMETRIC MEASUREMENTS IN CLINICAL BIOCHEMISTRY *

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I. Introduction

The hope and single purpose of this dissertation is to aid the clinical technician in a better understanding and use of the photometer and its adaptation to colorimetric biochemical methods. Practically all clinical biochemical methods employed today in the analysis of body fluids and specimens are colorimetric and have been adapted to photometric measurement. The photometer, photoelectric colorimeter, phototelometer, spectrophotometer, hemoglobinometer, or any of the other similarly named instruments have supplanted the block comparator and visual colorimeter as photometric measurement gives a more rapid and accurate color measurement which is highly desirable when multiple determinations are to be made. The clinical technician should have a good working knowledge of the principles of the operation of the photometer, its standardization, and manual operation.

The use of photometers which are standardized when purchased is to be discouraged unless the technician using them is fully acquainted with the method used as to its limitations and possible errors, and with the photometer as to possible mechanical or electrical defects which may be present or develop during usage. There are many reasons why a technician should be able to check or restandardize a photometer already standardized, some of which may be enumerated as follows:

(1) The reagents used and the conditions under which the photometer was originally standardized may not be the same as those the technician employs even though prepared reagents recommended by the manufacturer are used, which incidentally are usually much more expensive than those prepared in the laboratory or purchased locally.

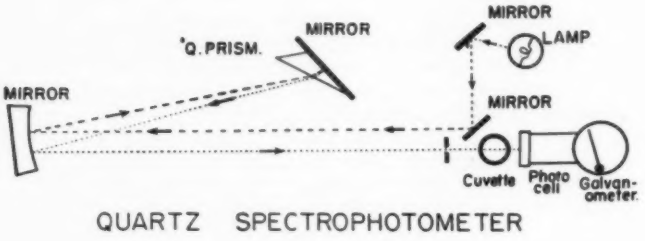
(2) Standards should be run with each batch of determinations or at routine intervals as a check on the skill of the technician, the reproducibility of the method, and the proper functioning of the photometer.

(3) If the technician has a good working knowledge of the standardization of the photometer, other methods can be used for which the photometer has not been standardized or new improved methods which appear in the literature may be quickly adapted to the photometer.

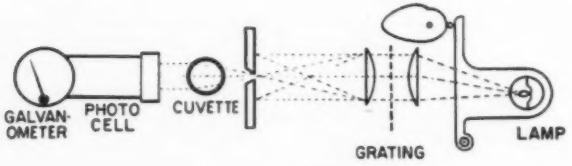
* Read before ASMT Convention, Houston, June 1950

II. Mechanical Construction of the Photometer (Fig. I)

White light from an incandescent excitor bulb is dispersed by a quartz prism or defraction grating (as in the Beckman or Coleman spectrophotometers) or light filters (colored glass, as in the Klett photoelectric colorimeter) into light of selected uniform waves or color or wave length. This light is directed by lens and mirrors through a colored sample solution contained in a standard test tube, cell, or cuvette to a photoelectric cell. The cell transforms the emitted light to electrical energy, which is measured by a micro ammeter or galvanometer.



QUARTZ SPECTROPHOTOMETER



COLEMAN SPECTROPHOTOMETER

FIGURE 1
Diagram of two types of Spectrophotometers (Beckman and Coleman)

III. Development of Formulas to Express Quantitative Light Measurement by the Photometer

The micro ammeter or galvanometer of the photometer simply measures the relative amount of light transmitted or passed through a solution, the amount being more with lighter colored and less with darker colored solutions. The amount of light

Table I
Formulas Used in Photometric Colorimetry

1. $\text{Concentration} = \frac{\text{Density of Unknown}}{\text{Density of Standard}} \times \text{Concentration of Standard}$
2. If ratio of Concentration to Light Density is constant,
$$\frac{C}{D} = K$$
3. Lambert-Beer Law: $C = K \text{ Log } \frac{1}{T} = -K \text{ Log } T = K(2 - \text{Log } \% \text{ T})$

transmitted is therefore inversely proportional to the concentration of the substance producing the color. In other words, the Lambert-Beer Law (Table I) states that the concentration C of a colored substance in solution is proportional to the log of the reciprocal of the transmittance, T, times a constant factor K: $C = K \log \frac{1}{T} = -K \log T = K\ (2 - \log \%\ T)$. The K factor includes all the constants of the procedure such as amount of sample, volume of filtrates, concentration of standard, density of color of sample in solution at the light transmission used, etc. K expresses the constant ratio of concentration to light density, $K = \frac{C}{D}$. If the photometer is equipped with a density (D) (Extinction) scale, which is simply a numerical calibration equivalent to $-\log T$ or $2 - \log \%\ T$, the concentration of a colored substance may be calculated from the formula $C = \frac{D(\text{Unknown})}{D(\text{Standard})} \times C\ (\text{Standard})$. If the ratio of concentration to density or transmission changes in their proportionality to each other, K is no longer a constant and the colored solution no longer obeys the Lambert-Beer Law. This condition may result from a colloidal condition of the color, turbidity, or the interference of colored reagents which cannot be separated from the spectrum of the particular color being measured. A colored solution usually absorbs a much greater amount of light in one or more narrow bands of the spectrum. This region may be found by passing light of different wave lengths through the solution and measuring the light transmitted to the photo cell. The smallest percentage of transmitted light occurs at the characteristic absorption bands of the color of the solution. Light of specific wave length, for transmission measurement of the concentration of a given colored substance in a solution, is selected in this manner to obtain maximum light absorption.

IV. Operation and Care of the Photometer

No specific instruction will be given for the operation of the photometer as operating manuals are furnished with the different types of photometers when purchased. There are, however, cer-

tain general procedures and precautions which should be followed, regardless of the type of photometer used, which are as follows:

(1) If the photometer is operated directly from a power line with a transformer, check for adequate constancy of line voltage or efficiency of transformer or voltage regulator. Make certain other electrical equipment in the vicinity will not interfere with the operation of the photometer. If the photometer is operated from wet or dry batteries, make a routine check for proper charge or voltage. Check electrical circuits for loose or faulty connections. Keep extraneous light from photo cell while making measurements.

(2) Make periodic checks for electrical or mechanical changes in the photometer with adequate standards. The filaments of the excitor lamp may change in position or brilliance from those of a previous standardization. Run a standard with any series of determinations as a check on the constancy of the operation of the machine and as a check on variations of technique and reagents used in the method.

(3) Use standard, especially calibrated test tubes, cells, cuvettes, etc., of matched uniformity to hold solutions for measurement of their light transmission. Keep the surfaces of these glass vessels free of scratches, film, dirt, and fingerprints as these conditions interfere with uniform light measurement.

(4) Keep the photometer covered at all times when not in use to prevent dust from entering the optical system.

V. Selection of Proper Method for Photometric Standardization

An ideal photometric method for use in a clinical laboratory should have the following attributes:

(1) Measures accurately the specific substance or material to be determined.

(2) It is rapid, saves labor, and permits early reporting of results. It is preferable that a maximum stable color is produced within 5 to 20 minutes.

(3) It is simple, requires the least special technique and skill of the analyst.

(4) It produces a stable, linear color of sufficient color intensity to be readily measured by the photometer. If the color is in the visual spectrum, less expensive photometers may be used. (Table II).

(5) It is economical, requires minimal time and the simplest, least expensive reagents (toxic reagents should be avoided), and apparatus.

There are no ideal methods, and compromises must be made by giving more emphasis to certain attributes more desirable of an ideal method. Unfortunately all biochemical methods used in clinical laboratories have not been standardized or developed

to the extent that they can be considered ideal or official for clinical chemists. Most clinical biochemical photometric methods now in use have been developed within the past ten years, and

Table II

Wave Length of Various Radiations

Radiation	Ångstroms (Å)*	Millimicrons (mu)
Cosmic Rays	0.0005	.....
Gamma Rays	0.01— 1.40	.....
X-Rays	10— 150	.....
Ultra Violet	2000—4000	200—400
Visible Spectrum	4000—7000	400—700
Violet	4000—4240	400—424
Blue	4240—4912	424—491
Green	4912—5750	491—575
Yellow	5750—5850	575—585
Orange	5850—6470	585—647
Red	6470—7000	647—700
Infra Red	7000	700
Hertzian Waves	2.20×10^{6}	.....

The radiations which are used in various types of photometers for measurement of colors of solution, films, etc., are the X-Ray, visible spectrum and infra red up to radiations of 1600 millimicrons.

* (Å) = 10^{-8} cm.)

this branch of science can be considered in an early developmental stage.

VI. An Outline of the Procedure to be Followed for Standardizing the Photometer

A. Conditions of Standardization

It is beyond the scope of this paper to discuss all the conditions which must be established in the development of an analytical photometric method, such as optimum concentration of all the chemical reagents employed, the effect of time and temperature on the development of a specific, stable, colored solution for the measurement of the concentration of a given substance. Instead, an outline of the adaptation of an established colorimetric method to the photometer will be presented.

Selection of the optimum light transmission to give maximum absorption of the colored solution to be measured is made by measuring light absorption of known concentrations of the pure substance (Standards) in a volume required for reading; concentrations which should cover the range expected in both normal and abnormal conditions and preferably cover a transmission of from 15 to 85 percent. These measurements are made with the photometer set at 100% transmission with a representative blank. Percent transmission readings may be taken at 5, 10, or 20 millimicron intervals with a spectrophotometer or with color filters with a photoelectric colorimeter. These readings are plotted on a chart against changes in light wave length (Figure 2) to facili-

tate the selection of the optimum light transmission for maximum absorption. An ideal light transmission is indicated at a flat portion of the light density transmission curve where maximum transmission occurs. At this point small changes in the wave length of light used (errors in setting the transmission knob or differences in glass light filter) cause little or no differences in percent transmission.

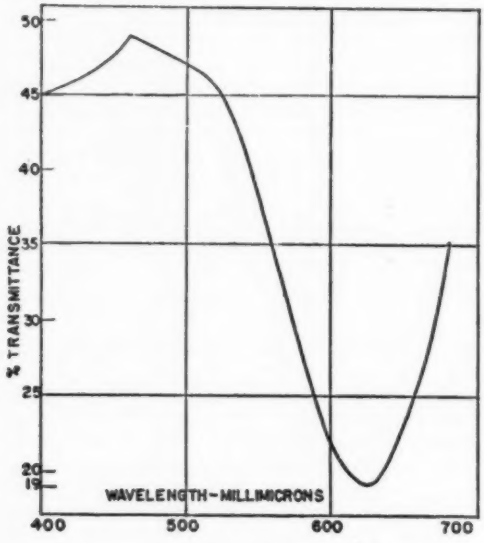


FIGURE 2

Spectral transmittance of the color developed by 2 ml. of acetic anhydride sulfuric acid reagent (4:1) added to 0.5 mg. of cholesterol in 5 ml. of chloroform at 0°. Transmittance 80 minutes after color development. (Coleman Spectrophotometer)

When the proper portion of the light spectrum and the concentration of the pure substance representing the average normal level which will give a 50% transmission has been established, the quantity of unknown sample is calculated which after chemical treatment, dilution, filtering, and color development in proper volume for photometric reading will, when an average normal quantity of the substance to be measured is present, give a 50% transmission. This will leave regions of the transmission scale for reading abnormally high and low concentrations. Photometers are not usually as sensitive

or accurate at transmissions measured below 15 and above 85% T. When the optimum sample and light transmission are known, determine the time required for maximum color development and its stability. The effect of temperature upon the rate and stability of color development should also be determined.

B. Example of Standardization

Preparation of Standardization Graph or Chart and Calculation of K Constant from Concentration—Transmittance Data

Standardization of Photometer for Blood Urea N Method

The expected range, and limit of color development when urease and Nessler's is used for blood urea N determination is 5 to 50 mg. per 100 ml. of blood. Acid tungstate filtrate of whole blood is buffered and incubated with urease and finally diluted to a volume of 12.5 ml. with Nessler's and water. The color is read at 520 mu light transmission. Under these conditions concentration-transmittance data are obtained with known concentrations of urea N with a (Coleman) photometer (Table III) from which the volume of acid tungstate filtrate (blood diluted 1/10) to use is calculated. The K factor is calculated from the formula C mg/100 ml. $= K(2 - \log \%\ T)$. Per cent transmission may be ploted against the equivalent blood concentration of urea N per 100 ml. on semilog paper. A relatively straight line is obtained since the calculated K factors are relatively constant. A table is prepared from this chart to give equivalent urea N concentration for each % T reading, or since K is known the C(mg./100 ml.) for each % T calculated.

Table III

ml. of Std. 2 mg. %	Urea N mg.	Eq. Blood Urea N* mg. % $\frac{(100)}{(0.2)}$	%T	K**
1.0	0.02	10	77	87
2.0	0.04	20	58	85
2.5	0.05	25	50	84
3.0	0.06	30	44	83
4.0	0.08	40	34	85
5.0	0.10	50	25	85

* $\frac{.05}{25} \times 100 = 0.2$ ml. blood sample required = 2 ml. filtrate

** $K = \frac{\text{C mg./100 ml.}}{2 - \text{Log \% T}}$

In some methods in which the disappearance of color is a measure of increasing amounts of the substance being measured (permanganate titration of calcium oxalate in sulfuric acid, uranium acetate—sodium method, ceric sulfate—iodine method, etc.), the formula for calculating the concentration may be stated: $C = K(2 - \log [100 - \%\ T])$.

THE PUBLICITY WORK SHOP

Presented by the Members of the Public Relations Committee of the

AMERICAN SOCIETY OF MEDICAL TECHNOLOGISTS

At Houston, Texas, June, 1950

Emcee: MISS FRIEDA H. CLAUSSEN M.T. (ASCP), Chm. *St. Paul, Minn.*
Clear Channels: MISS MARY NIX M.T. (ASCP) *Portland, Oregon*
Effects: MISS JOSEPHINE PYLE M.T. (ASCP) *Middletown, Conn.*
Static: MISS LAVINA B. WHITE M.T. (ASCP) *Pueblo, Colorado*
Master Control: MISS DORIS BOON M.T. (ASCP) *Cleveland, Ohio*

Introduction

EMCEE: Good evening Ladies and Gentlemen. This is station A.S.M.T., broadcasting to you from the Assembly Room of the Shamrock Hotel, in Houston, Texas.

We have, gathered here this evening, a group of experts, each of whom has made an intensive study of some particular field of publicity, or of some particular group with whom we might think it advisable to establish good "Public Relations."

Definition is always a good starting point for any discussion. Let us, therefore, first have a clear understanding of just WHAT "Public Relations" is.

One authority says, very simply, "Public Relations is nothing more than putting the Golden Rule into effect—doing unto others as you would be done by." To which someone has added the suggestion, "But do it first." Another has said that Public Relations is merely good morals and manners. For our purpose, let us consider Public Relations as that course of action which guides an individual or an institution or an organization in a course which will earn and hold the favorable opinion of the public.

Civilization depends for its very existence upon the ability of individual men and women to pool their resources—to cooperate, to work together, for objectives which benefit society as a whole. Cooperation has its basis in understanding. The basic human need to understand has been the prime stimulant and a fundamental ingredient of religion, education, philosophy and many other fields of human endeavor and human association. During the twentieth century a new term and a new concept have entered into the historic human struggle for understanding. This term is Public Relations. The public relations task of an organization is to establish a policy of doing good, then to do good, and then to tell about it.

Publicity consists in "telling about it." Publicity is the exposition of an idea, and good publicity can only be based on sound public relations. A sound public relations program can be

wholly effective only when it is active, i.e., translated, visualized or presented in easily understandable terms to all levels of public with which it is concerned.

Public Relations and publicity go hand in hand. They are interdependent. Good public relations can exist without good publicity, but only as a light under a bushel. Publicity, on the other hand, cannot achieve a useful purpose unless it is based on sound public relations. So, public relations becomes the horse, and publicity, the cart.

So much for definitions. Now let us consider Public Relations at work. This is the process of getting attention, expressing ideas, establishing communication and obtaining ACTION.

When an organization launches a public relations program, the first step is research. Research accomplishes two necessary results. First, it develops the pertinent fact and secondly it interprets the organization to the public. Our experts have started the first step. We hope YOU will help us to continue with the second.

Leaders in public relations work carry certain standards. They tell the truth. They observe restraint. They practice only in behalf of causes they can sincerely espouse. They do not misrepresent. They do not serve competing organizations. They do not malign competitors.

The study of Public Relations work is fascinating and its possibilities are limitless. I could go on for hours repeating things I have read and learned. But our time is limited and our experts are waiting to tell you about their own research work, and the facts they have assembled to try to educate you all in the field and to help you to carry home with you what you have learned this evening, in order to carry on the work of public relations in your own states.

We have purposely omitted any mention of the recruitment phase of Publicity and Public Relations, because it is such a large part of the subject in itself and is being so adequately handled by the Vocational Guidance workers of the Education Committee.

Each "expert" will speak from five to eight minutes on his subject, and each will be followed by a short discussion period which will give an opportunity for questions and exchange of ideas. And finally I will summarize for you an outline for the plans of the Public Relations Committee for the coming year, with recommendations for your own use.

Our first speaker is Miss Mary Nix, of Portland, Oregon, who will present:

CLEAR CHANNELS

Time was when publicity was thought of in terms of "A piece in the paper." Those were the days when a large number of clippings was the sole criterion of a successful publicity program.

We have a different concept of newspaper publicity today. We have come to realize that an agency name such as A.S.M.T. means nothing to the reader unless it is related in some way to activities that will make him understand A.S.M.T. a little better. Our daily work is concerned with human problems and our knowledge of and experience with these problems through the medium of the newspapers can be most effective in creating public interest, understanding, support and good will. Experts point out that all kinds of people can be reached through the newspapers when they are in a receptive mood. People read newspapers not because they have to but because they want to. Most important of all newspaper stories carry authority and prestige. "I saw it in the paper" is the final argument.

Today we have a more receptive reading public concerned with social and health problems. People are interested in other people, how they are getting along, what handicaps they live under, and how they can be helped. You have the good will and kindly intent of the newspapers. Though you may not think so, editors feel a certain obligation to give the community news breaks whenever possible.

We are often guilty of bad newspaper manners because we do not realize the best way to the editor's heart is to view his job as our job, to understand his problems of putting together at top speed a daily report of world and local events.

One means of avoiding this is to meet the editor and have a visit with him. This may be done by simply calling him on the phone and requesting an appointment or have a mutual friend do it. When you do, be prepared to identify yourself. You are corresponding secretary or public relations chairman of A.S.M.T. State your case simply. Be prepared to answer any and all questions about A.S.M.T. To do this you must first be well informed regarding the organizations policies, aims and objectives. Now you have made a friendly contact. Ask your editor for advice. Remember he is a busy man and make your visit brief.

If you wish you may have your story written to give the editor. If this procedure is followed, the following mechanical rules are desirable:

1) Always tell WHO, WHAT, WHY, WHEN and WHERE as briefly and as soon as possible in your story. The five "Ws" are a must in writing newspaper stories and articles. If you can answer the following questions "Who did or said it; WHEN did he say it; WHAT briefly did he say;

WHERE did it happen and WHY in the first sentence or paragraph you have an excellent beginning. Subsequent paragraphs can be devoted to more details, explanation and other information. The first paragraph of the story should be so complete it would give the reader all the essentials if printed by itself.

2) Begin your story half way down the page. Leave room at the top for the editor to write instructions to copy desk and typesetter.
3) Always type stories DOUBLE or TRIPLE space on one side of the paper.
4) Make your story easy to identify by typing the following in the upper left corner: Your name, the agency name (A.S.M.T.) or (OAMT). Do not abbreviate. Address and phone number. Use 8½ x 11 inch sheet.
5) Give in the upper right hand corner the day it can be published. Give the editor three days time to publish the story. If you have two newspapers give same release date and story to both papers. Don't be partial.
6) If a reporter is assigned to cover your organization, BE COOPERATIVE and never go over his head.
7) Notify the newspapers in advance at least four days if meetings, luncheons, or rallies are to be held so that if reporters and/or photographers are sent to cover the story there is time to schedule assignments.
8) **Never** write a headline for your story. Each paper has its own rules and styles for headlines, and employs experts to do just that.
9) Don't hound the editor or complain that your story landed in the society column instead of page one. (Next time it may reach the advertising section.)
10) When reporters or photographers are invited to attend a meeting, luncheon or dinner, provide a press table where they can easily hear and see. Don't forget they too get hungry and are doing you a favor.
11) It is a good idea to have a copy of the main speech plus information regarding the purpose, occasion, names and all facts about the occasion written out to give the reporter.
12) **Don't over write.** Tell your story simply, otherwise it may not get in print.
13) Avoid adjectives such as lovely, pretty, inspiring, delightful.
14) Your editor must find you reliable.
15) Watch your language. Jargon and technical language should be avoided.

These techniques should help to establish and further the

friendly relationship with your newspaper. They are elementary but of tremendous importance when editors have neither the time nor the facilities for having a story retyped, rewritten, or otherwise put into shape for publication.

It is our hope that this minimum of information on newspaper publicity will help you to prepare your releases so they will be easy for the editor to read, consider and use. As a result your story should find a clear channel on its way to being read in the pages of your newspaper.

Emcee:

Our second speaker is Miss Josephine Pyle, of Middletown, Connecticut, who will present:

"EFFECTS," or "THE HOW AND WHY OF MAKING YOURSELF KNOWN."

Most of us, I'm sure, read that startling article in the April issue of the Woman's Home Companion entitled MENACE IN THE MEDICAL LABS. It was written by Mr. Albert Deutsch. I was so upset when I read that article that I know my blood pressure must have reached a new high. But being upset is not enough. Unfortunately, we can not run away from this situation that Mr. Deutsch writes about. We've got to stay with it and live with it—and so it is our responsibility to do something POSITIVE about it.

Although I believe that the author misrepresented many facts, he has directly or indirectly done us a great favor. He has jabbed a stick into the hornet's nest and now is the time for you and me to assume the responsibilities that we have to ourselves, our fellow workers, and our profession. And if Medical Technologists are to take their rightful place among recognized professions, we, in this room, and others like us, are going to have to boost it, fight for it, praise it, and be proud of it.

Before I started to think about it seriously I found myself trying to push the blame off on everybody else. I even blamed the Registry and the National Society for not fighting for us, for not raising the standards of training for laboratory personnel, for not educating the doctors and the general public regarding Medical Technologists (ASCP) and the American Society of Medical Technologists. But the more I condemned and blamed, the more I realized that I was actually accusing our State societies, our District societies, our local societies—YOU and ME!

Each of us has a job to do. Alone, we can attack only a small part of the over-all problem but when each of us does a little bit, we'll find that all these "little bits" add up to help solve the complete problem.

REGISTRY PINS AND OFFICIAL INGIGNIA—Make a

mental promise right now to start wearing your registry pin or other official insignia. In a recent survey taken of 50 ASCP registered Medical Technologists in Connecticut only 30% were wearing their pins. The guilty 70% would feel embarrassed if you charged them of being ashamed of their profession—but that is what they are telling the public when they appear without a pin.

And remember that no one will ever see your Medical Technologist certificate if you keep it hidden in the attic trunk. Have it framed and hang it on the wall in the laboratory where you work. You've earned it. Be proud of it!

Recently Frieda Claussen sent me a sample of an identification tape which is being used in the Miller Hospital laboratory in St. Paul.

Members in our lab at the Middlesex Hospital liked it immediately so now, in addition to our registry pin, we wear this label across the top of the upper pocket on our uniforms. People notice it, doctors, nurses, patients—as one hospital employee said, "Now you really ARE someone — before, well, you were nothing special."

Incidentally, these labels cost only 75 cents a dozen—cheap but effective advertising. But, in this drive to make people "Medical Technology conscious" and to advertise Technologists, remember that no matter how much you advertise a product, it will not continue to sell unless it is a good product.

SPECIAL EVENTS—Throughout the year there are many special event days, some that are directly connected with your work, others which you can become a part of simply by showing a willingness to do a little extra work.

Each year National Hospital Day is celebrated throughout the nation. Many hospitals hold "OPEN HOUSE" and invite the public to visit the institution. Make certain the tour includes your laboratory and once you have people on your own home ground make them conscious of what goes on in the lab and what your duties are as a Medical Technologist. Have literature available—take time to talk to them in their language. Carry out an actual procedure while they watch. Use posters and exhibits—the Registry has them available for your use if you ask for them in advance.

MAGAZINE ARTICLES—If someone within your group writes an article about your profession, make every effort possible to have it printed in one or more of the professional magazines—or if you read an article which impresses you, write to the author and tell him so. Remember that criticism, like public relations, is "commending the good and condemning the bad." If you believe an article casts false impressions on medical technology, put your thoughts in writing and send it to the maga-

zine. Nothing will make a publisher sit up and take notice as fast as critical, uncomplimentary letters and complaints from the reading public. It is this public that buys his magazine—and keeps him in business! Better letters are written, however, after you've had a chance to sleep on it!

THIS IS IMPORTANT—Keep your eyes open for publicity about this profession—good and bad publicity—and do something about it.

RADIO—Make full use of the radio. It is an invention of our generation and it is up to our generation to take advantage of it. Many of our towns, small and large, have local radio stations, able and willing to be a part of the community and to give free air time to community projects.

Informal programs, interviews with outstanding local personalities, air talks with school children will all command listener's interest.

COMMUNITY RELATIONS—I was talking to the Assistant Director of our School of Nursing the other day and she told me that one of the things they had learned about their organization was that they were not making enough use of laymen in their public relations. Many groups, particularly professional groups, have been called "narrow" and rightfully so. Let's not fall into such a group. Make friends with your community leaders. Participate in your communities' own activities. Become an integral part of your town's life, even though it may be difficult to assume outside responsibilities when you're busy and overworked. If you want to do something badly enough, you'll make time for it. Your association with a group in the community may prove to be very beneficial not only to Medical Technology but to yourself.

I know that many of you have already taken your individual responsibility quite seriously, but too many of us have not. Be proud of your profession. Take advantage of every opportunity to establish good public relations. "If you cannot do great things, you can do small things in a great way."

Emcee:

Our third speaker is Miss Lavina B. White of Pueblo, Colorado, who will present:

"STATIC," or "WHAT ARE THE REAL FACTS?"

STATIC

Members of the American Society of Medical Technologists:

This greeting is emphasized because it means that, gathered here are medical technologists registered under the auspices of the Board of Registry of the American Society of Clinical Pathologists. This branch of medicine under which we serve, has

authorized us to perform tests and details of laboratory procedure, and has recognized us with acceptance of our work, and our word in such matters. The "Registry" is universally accepted as the authoritative body for qualifying laboratory workers. Its standards are endorsed and accepted by such groups as the American Medical Association, the American College of Surgeons and the American Hospital Association.

The American Society of Medical Technologists has over 4,000 members representing about 31.5% of the 12,695 A.S.C.P. registered medical technologists in the United States. This figure is as of December, 1949, and is constantly increasing.

The society was organized as the American Society of Clinical Laboratory Technicians, June 12, 1933 in Chicago, Illinois—a Michigan Corporation located in the City of Detroit, County of Wayne, State of Michigan. Membership is limited to those who hold a certificate from, and are in good standing with the Board of Registry of Medical Technologists (A.S.C.P.) or, those who possess a degree at least at a master's level from an accredited college in any of the six major fields of Medical Technology and have one years experience in a clinical laboratory approved by any member of the American Society of Clinical Pathologists.

You are well acquainted with the purposes for which this society is organized and that they represent the highest standards of laboratory medicine. The individual and subordinate groups never vary from our national purposes, and as a result, the membership benefits all along the way. This is the smooth running routine of our society, with all the affiliate groups coordinating in the plan, carrying out ideals and furthering the progress of A.S.M.T.

In every field of professional endeavor, a good general education and thorough technical preparation are becoming increasinglv important. Nowhere is this more true than in the realm of medical technology. Too much emphasis, therefore cannot be given to that feature of the American Society of Medical Technologists which requires that its members be registered by A.S.C.P., the American Society of Clinical Pathologists, which compels every member of the society to come up to the educational standards set up for him by A.S.C.P., that body which is itself made up of those highly trained and qualified in the fields of medicine and pathology and hence calculated to be careful and even exacting in the selection of those destined to practice their specialty of medical technology under them or in close association with them.

In 1939 another medical technologist's organization was founded, known as "The American Medical Technologists," incorporated in New Jersey. Without disparaging any other group,

we would like to point out that the American Medical Technologists do not possess the outstanding advantage that we have just pointed out, in that its membership qualifications are necessarily internal in that they rest on their own examining board. It therefore lacks that independent control that is, in our opinion, so vital.

From their pamphlet entitled "ARE YOU A REGISTERED MEDICAL TECHNOLOGIST? Protect your Professional Status. Register today with the American Medical Technologists." They list themselves as: "the only national organization of medical technologists legally incorporated and the only one registered as such in Washington D. C. It is recognized by the American College of Medical Technologists. The A.M.T. is the recognized National Organization of medical technologists, and it sponsors 48 state societies, five city societies and six affiliating groups in foreign countries."

Now what is the American College of Medical Technologists? From the Bulletin on A.C.M.T. issued by the Council on Educational Qualifications and Standards of the American Medical Technologists: "The A.C.M.T. was duly incorporated by virtue of the laws of New Jersey, at Trenton, N. J., on May 5th, 1942, and registered at Washington D. C., on July 15, 1942. Fellowship is limited, and only those clinical laboratory directors, instructors in Medical Technology, research Medical Technologists, and senior Medical Technologists who possess above average qualifications are acceptable. The qualifications for fellowship are the most rigid and of the highest standard in the profession of Medical Technology."

The board of directors of A.M.T. appoint the officers of the A.C.M.T. from its own board members and these comprise the A.C.M.T. The president of A.M.T. is appointed from the sponsoring group of board members (By-laws Section III (A), not elected by the members-at-large or a House of Delegates). "The A.M.T. is 'legally' permitted to confer the title of M.T. on applicants and issue certificates of registration of membership." Under the direction of A.M.T. the examinations are given to students training in schools recommended by the A.C.M.T. Many of these schools are the commercial training systems.

The A.M.T. "advocates state licensure for ALL technicians and has drawn up a model Bill for legislation that is now in process of enactment in several states." This bill would put control of all laboratories, medical technologists (A.S.C.P.) and pathologists in the hands of A.M.T. and A.C.M.T., the two being composed of the same members. The membership, according to A.M.T. statements includes about 4,000 members, 1,808 paid up, who finance the A.M.T. and A.C.M.T. groups.

What has been said about these claims may be truly founded

and is not questioned. We, as members of A.S.M.T. can stand by the fact that we are not acting in the place of a qualifying board or registration committee, any more than the American Medical Association qualifies doctors of medicine. The American Society of Clinical Pathologists is made up of doctors of medicine with a specialty in pathology. There was no easy way for our doctors or directors to become qualified pathologists, and they would or should not accept assistants or technologists unless a similar pattern was established. We have fulfilled those requirements and have met the standards of our profession. We have graduated from schools approved by the Council on Medical Education and Hospitals of the American Medical Association. We must be sure, that saying "registered," does not qualify us, but must EMPHASIZE THE FACT that we are A.S.C.P. REGISTERED. Not only must we strengthen our position as THE qualified medical technologist, but we must clear the way for prospective students of medical technology. It is to our advantage to assure the young, earnest persons who spend their time and money that their training will be of definite value in the profession of medical technology.

How we can do these vital jobs deserves our complete attention. Our society is not assembled to boast of achievements, but to represent the fruits of our labors at our jobs, to improve our status as medical technologists (ASCP) to learn more from the members of the medical profession who will give us of their best, to lead the way to better understanding of our profession by presenting ourselves in an outstanding manner to the public, and especially to those who will some day take our places here.

Emcee:

And last, but not least is Miss Doris Boon, of Cleveland, Ohio, who will present:

"MASTER CONTROL," or "THE INTERNATIONAL PICTURE."

Suppose some catastrophe befell your laboratory tonight, wrecking the place. The first thing tomorrow everyone would naturally assume that work in your department would have to be discontinued for the time being. Then you would start on the task of inventory; you would order the new things you need, whether it was a hemocytometer, new walls, or someone to help you. Within a few weeks you could start operations again, thankful, perhaps, that you had not been injured in the accident.

On the other side of the globe there is a different story these days. The catastrophe was the war. Other laboratories can't do the work you have to turn down, they are in the same fix; so you do what you can meanwhile, whatever the condition of

your department. Chances are, besides the added work, you have less personnel, some of them were killed in the disaster. Make your list of necessary items for operating a laboratory, now try to get them. No money. No place to get them in your own country even if you did have the money. So what to do next? We'd want to give up and find another field of work. Even if that were possible, the other fields are as bad off. So it goes.

We are talking of Public Relations---What kind of public is more important to us than fellow scientists in need? Their brilliant minds, too, could accomplish great things if they had the facilities some of us take for granted. What kind of laboratory work can be done without a microscope?

I hope, by now, you are thinking that perhaps you could share some of your good fortune with them. You might even be thinking of some particular item you'd like to send, but "who needs it?," you ask. That is where UNESCO comes in. United Nations Educational Scientific Cultural Organization maintains a clearing house for all this information. This organization has made studies of the many different fields, to make public the needs of these people all over the world. They promote the aid to these people without actually doing the work themselves. In other words, from UNESCO we might learn that a certain University in Vienna needs two microscopes. We in turn, assume the project of raising money to send them. If we did this without UNESCO we might be sending 'scopes to some institution for the blind.

In case some of you need to be reminded of UNESCO's goals, as I did, I will give them to you briefly: "Stimulation of world-wide efforts to wipe out illiteracy as a first step on raising the standards of living. The broadest use of schools, libraries, press, publications, films and radio for the spread of knowledge and understandings among peoples. Encouraging the world-wide interchange of ideas and cultural achievements. Stimulating the cooperation of scientists and making available the results of their research. Identifying and helping to remove social, religious, and racial tensions and combating the prejudices and ignorance which hinder friendly relations." Surely, through all these projects some kind of better understanding can be developed to promote world peace.

By now, I hope you are really thinking in terms of action, because there are a number of things we can do, as individuals, local, state, or as a national group.

Educational Reconstruction holds first priority. Contributions as little as two dollars might buy notebooks and paper for a student for a year. When the need is so great, how can you stop at that? Books in the CARE program provide a simple project for any size group.

In the exchange of students, teachers, and other workers there are many opportunities for us as individuals and groups. As a large group, ASMT, for example, we might provide a fellowship for exchange students. If we didn't want to undertake the whole thing, there are many students who have their transportation provided but still cannot leave home for lack of room and board expenses. There are thousands of foreign students already in our country, made possible by some other organization. We can make their stay here of more value by providing opportunities for them to see other parts of the country, to hear lectures and concerts, and generally to feel like one of us. You can find out in your own community who the foreign students are, invite them into your home, provide a place for them to get acquainted with other students. This project of exchange people does great things, not only for you and him, but for the community, and the countries too. They are called the unofficial ambassadors of good will.

Read about the school situation in Poland alone and you will be spurred to action. Tell your fellow workers about UNESCO. You'll find your outlook broadened, find it easier to tolerate that "foreigner" you thought you didn't like. We're all just people, under the skin, whatever color it is.

If one of these suggestions doesn't sound like what you want, work out an original idea to fit your ambition. Above all do something about the world situation, or the world situation will do something about us.

Miss Claussen:

Having given you a brief but concentrated view of the ramifications of Public Relations, and its attending publicity, I would like to close with some suggestions and recommendations for the coming year, and an outline of how this committee plans to carry on its work.

I would like, first, to suggest that each state president appoint at once a Public Relations Committee, with district representation within the state, and send me the name of the chairman immediately. That the national committee work through the state committees from now on, by releasing from time to time definite outlines and instructions for projects to be carried out on a nationwide scale.

Among these proposed projects, which we hope to carry out will be: a). Distribution of "Fact Sheets" for educating the physicians and pathologists of each state through their state medical journals, or through personal letters, about the true facts of A.S.M.T. standards, ethics and purposes. b). Getting acquainted with "the press" so that our activities and our profession are brought before the public with pictures and frequent

articles. c). Acquainting the public with the profession of Medical Technology and the work of a Medical Technologist by holding a National Laboratory Open House. (This has already been tried on a local basis and everyone was very enthusiastic about making it a yearly occasion.) d). Collection of "case-histories" in which lives have been SAVED through the work of well-qualified Medical Technologists, with the hope of finding a good author to write a magazine article entitled "MIRACLES OF THE MEDICAL LABS." e). Opening of a monthly column or section to be published in HOSPITAL TOPICS, a publication received in every hospital and sanitarium in the U. S., as well as in Army and Navy institutions. (We have received this invitation through the courtesy of the publisher, Mr. Gordon M. Marshall, and have been asked to prepare a monthly column or section that will be published in HOSPITAL TOPICS. This material may consist of news items about members, the society or affiliated societies, short articles on technique, recent discoveries of interest to the profession, abstracts of scientific articles written by Medical Technologists for the State or National Journals, and such other topics as may be deemed suitable.) State Publicity Chairmen will be furnished with rules and regulations regarding submitting of material, including pictures, information about dead-lines, etc. f). Gathering of "ideas" from individuals (this means YOU), and from State Societies to help the spread of Publicity "stunts" or other effective means of education, so that we may ALL benefit by the successful things YOU have done, or the clever ideas YOU may have.

We hope that you have all benefited by our discussions here this evening, and that you will carry home with you, not only some very definite ideas and plans and additional knowledge, but so much spirit and enthusiasm for spreading the good word and the good work, that the whole wide world, by this time next year will know WHO we are, WHAT we do, and for WHAT we stand.

N. B. Mr. Lee B. Soucy also participated in the Public Workshop. His extemporaneous talk on "Advertising Medical Technology to the men in the country," was not received in written form for publication. The "gist" of his talk was, that we stress the profession too much as a woman's field, and would do well to interest more men, and to use the masculine gender as well as the feminine in our school bulletins, advertisements and general references.

N. B. I am indebted to Mr. Herbert M. Baus, from whose book "Public Relations at Work" the information in the introduction was obtained. This is Frieda Claussen, "Signing Off." "Thanks for Listenin'."

THE IMPEDANCE ANGLE AND THYROID DYSFUNCTION***

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Electrical measurements have for many years been made to determine the activities of the organs of the body; for example, the heart by the electrocardiograph, more recently, the brain by the electro-encephalograph. Sensitive machines for the purpose detect differences in potential. Norms have been determined so that deviations from the standard are useful for diagnosis or to show the progress either of the course of the disease or the effect of treatment.

Likewise, variations of the resistance of the body to an electric current have been noted for many years and associated with thyroid activity. Can changes in thyroid function be determined by electrical tests? The modern development of sensitive apparatus seems to answer that it can.

In many cases of mental illness, especially in anxiety neuroses, the symptoms oftentimes resemble hyperthyroidism, such as: hypersensitivity, insomnia, rapid pulse, tremor, physical unrest, loss of considerable weight, even the appearance of exophthalmos. The patients present a problem for metabolism tests. They cannot relax. Anxiety and fright prevent the existence of a basal condition. Metabolism readings are oftentimes extremely high, yet in many instances the patient may actually have a hypothyroidism. How can one distinguish between an anxiety neurosis and a true hyperthyroidism?

R. Gjessing of Oslo, Norway, found that treating certain types of mental illness with large doses of thyroid extract may produce remarkable results, so that the patient can return to a normal life. The treatment requires frequent and accurate metabolism tests. Obtaining a reliable check on these patients becomes a real problem.

In 1935 Molly A. B. Brazier, Ph.D., of London, England, (now at Harvard University) published an article on "The Impedance Angle in Thyrotoxicosis" that offers a possible solution to the problem.

Earlier workers had noted a correlation between the apparent electrical resistance of the body and thyroid disease. The earliest, R. Vigouroux, in 1888, observed that the resistance of a body to a direct current is useful in diagnosing certain diseases, including Graves' disease.

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* Submitted with the approval of Dr. Lewis Danziger, M.D., who supervised the work and Josef A. Kindwall, M.D., Medical Director of the Milwaukee Sanitarium, Wauwatosa 13, Wisconsin. Expenses partly defrayed by the Ada P. Kradwell Foundation.
** Hillkowitz Memorial Award, 1950 Convention ASMT, Houston, Tex.

There was little accomplished from a clinical standpoint because too many factors other than thyroid dysfunction interfered with the apparent resistance of the body to a direct current. The electrodes were applied directly to the skin. A polarizing effect at the site of the electrodes, a current flowing in the opposite direction to the applied current, causes the resistance measured by a Wheatstone bridge, to increase to several thousand ohms. Then too, the resistance depends on the contact area of the skin and is extremely sensitive to small changes in the contact of the electrodes caused by temperature changes, drying of the salt paste, pressure, the effect of psycho-galvanic reflexes brought about by emotional disturbances of the patient. A wet electrode, such as an arm bath, is impractical with a direct current because it is necessary to calculate the area of the immersed skin.

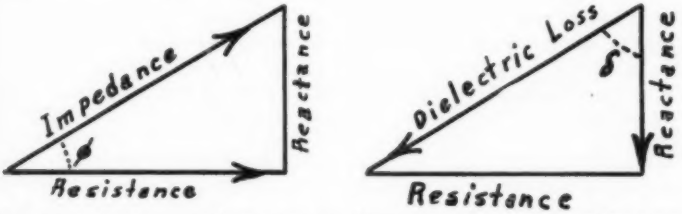
In the late 1920's experimenters turned to alternating current instead of direct current. The early work failed because of unstable equipment, the use of too low a frequency, and the same polarization effect at the site of applied electrodes. During this time a few German workers suggested a relationship between "skin capacity" and the basal metabolic rate. As equipment became perfected and more sensitive, some workers noted that the electrical properties of the skin were as valuable an index of thyroid dysfunction as the basal metabolism. In 1929 Roggenbau, Lueg and Grassheim observed that variations in resistance seemed to be specific for thyroid dysfunction. Others could establish no correlation. Out of the experimentation, nothing led to a test suitable for clinical work. The worker had to use electrodes of known area fastened to the patient's arms in spite of polarization with no way of determining or overcoming the amount of the polarity.

Dr. Brazier, using wet arm baths that eliminated the polarization effect, attacked the problem from the standpoint that the human body is a simple dielectric—a non-conductor or poor conductor—of unusual and irregular shape. In her study she found that her results confirmed that hypothesis and conformed to the laws of electricity.

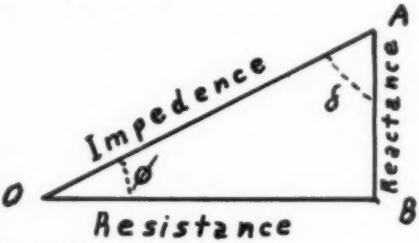
Dielectrics have a characteristic physical property, the dielectric loss angle, specific to the material of the dielectric. The quantitative measurement of this property is independent of the size and shape of the material, so that it becomes an ideal property for standardizing electrical measurements of the human body, regardless of its size or deformities.

When placed in a circuit of a current oscillating at a stabilized high frequency, the body acts as a condenser dielectric with resistance and reactance. The formulae and vectors of the electrical engineer apply and measurements of either the dielectric loss

angle or the impedance angle can be calculated, since the two angles are complementary, that is, $d + \phi = 90°$



Because the two angles are complementary the Rule of Pythagorus can be applied to the circuit. Impedance is the hypotenuse of a right triangle, so that



$$\text{Impedance} = \sqrt{\text{Resistance}^2 + \text{Reactance}^2}.$$

Since it can be seen from the diagram that a ratio exists between resistance and reactance, the impedance angle can be expressed more simply as a trigonometric function, so that it becomes:

$$\text{Tan} < \phi = \frac{AB}{OB}$$

$$\text{Also Tan} < \phi = \frac{AB}{OB} = \text{Cot} < d = \frac{AB}{OB}$$

$$\text{Similarly Cot} < \phi = \frac{OB}{AB} = \text{Tan} < d = \frac{OB}{AB}$$

Impedance is the combined effect of resistance and reactance—the latter being a combination of capacitance and inductance; all together they produce a lag in the current flow. Values of the impedance angle of normal adults have been found to be quite fixed with very slight variations, so that in clinical work, changes from the mean value of the impedance angle are considered.

Reactance may be measured directly by means of a bridge similar to a Wheatstone bridge, except that the resistance arms are replaced by reactances and the bridge must be used across an alternating current of known frequency since any change of the frequency will alter the reactance being measured.

Dr. Brazier's apparatus consisted of a stabilized oscillator with variable frequencies up to 50,000 per second, accurately calibrated and delivering a pure sine wave form. Another unit of the apparatus consisted of a modified Wheatstone bridge to which the patient was connected in such a way that the earth capacitances were eliminated. A heterodyne amplifier detector in the system connected to ear phones determined the neutrality point on the bridge by a silent point on the phones. The two units were shielded to prevent static interference and were separated to prevent an electromagnetic coupling.

Two separate baths containing 10 liters of approximately 1% sodium chloride formed the electrodes. Two lead plates of equal size in each tank connected the baths to a current source and the oscillator. This type of electrode eliminated the troublesome polarization effect that takes place when the electrodes are attached directly to the skin. The patient makes the connection between the electrodes by immersing the forearms above the elbows in the water baths. The current travels:
electrode → NaCl → Pt's arm → body → Pt's other arm → NaCl → electrode. In her work Dr. Brazier used a small current of .02 amperes oscillating at 20,000 cycles per second.

Since a rapidly alternating current does not allow enough time for sufficient ions to collect in the tissue to cause excitation, there is no sensation to the patient.

In her experimental work Dr. Brazier found the following conditions: 1. The strength of the AC current passing through the body varying from 0.00025-0.025 amperes produced no appreciable change in the bridge readings; 2. The strength of the saline of the arm baths should be held between 0.9% and 1.1%; 3. The temperature of the arm baths should be kept within the range of 12° and 33° C; and 4. For all frequencies between 5,000 and 50,000 cycles per second the impedance angle remained constant.

Dr. Brazier stressed the importance of the latter fact:—the constancy of the impedance angle through a wide range of frequencies—a characteristic property of a dielectric—is physiologically significant and upholds the theory that the body is a dielectric.

For our work at the Milwaukee Sanitarium the physicists of the Offner Electronics Laboratories in Chicago provided us with the instruments. In our early work we used an oscillator, a modified Wheatstone bridge consisting of a resistor and capacitor and

an oscilloscope for neutralizing the reactance—reducing the sine wave to a straight line. The reading in microfarads on the calibrated capacitor gave a direct reading for the tangent of the impedance angle.

At first the results were inconsistent because of insufficient amplification of the sine wave near the neutrality point. Adding an amplifier to the system seemed to overcome the difficulty until we ran into trouble again. The main power line supplied the current for the oscillator and oscilloscope, a battery supplied the amplifier. As the battery weakened our results became so inconsistent that we considered all of our work to be too impractical for any value. The physicists then set up a compact instrument —a carrying case containing all of the parts in one unit, requiring only one connection at the main power line.

Two adjustable dials, one for the resistance, the other for reactance, balance the bridge. Each dial is connected to an electric eye. For determining the neutrality point of the resistance a variable column in the eye is raised to its maximum height. Matching the height of a variable column with a fixed one, in the other eye, indicates the neutrality point of the reactance. The reactance dial is so calibrated that it gives a direct reading for the tangent of the impedance angle. The instrument gives consistent readings. Although it will not give as high values as the capacitor on our former equipment it is amply sufficient for any clinical purpose.

Our electrodes consist of two plastic tanks of a ten liter capacity each but, to allow for displacement when arms are immersed, are filled with about eight liters of approximately 1% saline. Two lead plates of equal size, one in each tank, transmit the current of low amperage oscillating at a fixed frequency of 10.000 cycles per second.

Our work supports Dr. Brazier's theories. One, that it is the body tissues rather than the skin that acts as a condenser dielectric. By immersing the arms at various depths, if only the skin were responsible, the impedance angle would be inversely proportional to the area of skin immersed. The resistance varies but the impedance angle remains constant. Also, there is no appreciable variation in the impedance angle of normal individuals whether it be the hard calloused skin of the manual laborer or the soft skin of the non-manual or professional person; the large flabby arms of the obese, the small, emaciated arms of the undernourished.

Dr. Brazier's hypothesis seems to hold true: that the dielectric of the human body consists of cell membranes of the tissue. When a current traverses the cells, the positive ions of the cell are drawn toward the membrane in the direction of the negative electrode while the negative ions move toward the positive side.

This accumulation of ions at the cell surfaces result in the cell membrane functioning as a condenser dielectric. One may reason: should any circumstance increase the permeability of the cell membranes some of these ions pass through toward their respective electrodes, thus reducing the number accumulated at the cell membrances themselves. This results in a diminished reactance of the membranes so that the dielectric loss angle increases, the impedance angle diminishes.

According to Crile, in Graves' disease the state of increased activity both as to growth and function follows a state of increased permeability of all the cells of the organism. This hyperpermeability of the cell membrane accounts for the increase in metabolism. Gellhorn has demonstrated that thyroxine will cause an increase in the permeability of the cell membranes of isolated tissues. Thus the low impedance angle of hyperthyroids conforms with Crile's theory.

The impedance angle remains fairly constant from day to day in normal people. Our work supports the normals established by Dr. Brazier on large numbers of individuals—for women 0.110 radians, for men 0.140 radians. Children vary with age, due to the physiological changes taking place during the growth period, although our work with children has been very limited.

We have found that meals, exercise, size, weight or age of adults or drugs such as sedatives or stimulants have no effect on the reading. However, thyroid extract and thyroxine decrease the readings and a true hypothyroidism gives high readings for the impedance angle. Readings are duplicated by any operator and require very little time—less than two minutes. Since we work with mental patients, generally the first reaction is skepticism and mistrust, but after the first test is completed we have complete, willing co-operation. They enjoy being "angled."

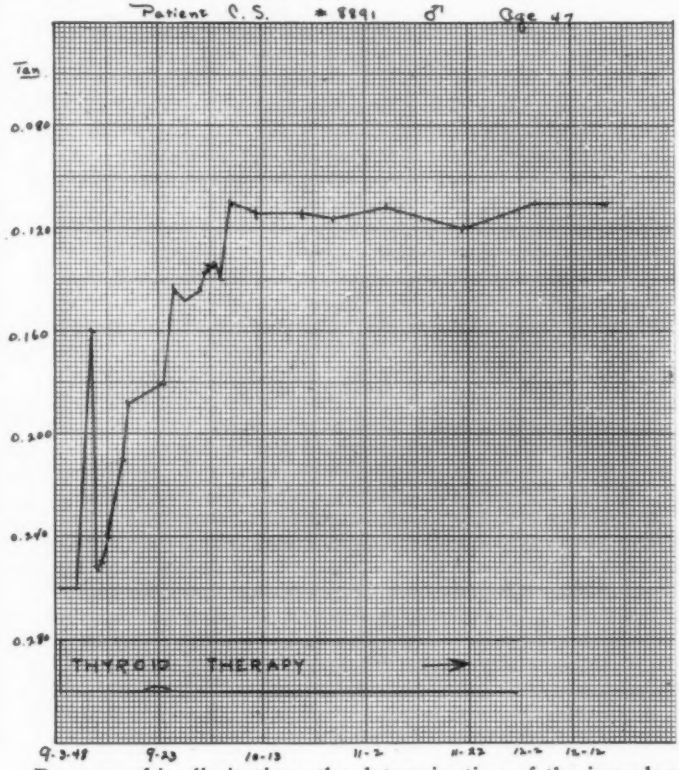
We keep the solution at a comfortable temperature, around 30° C to minimize any movement that might occur from the reaction to cold water, such as shivering. Movement of the patient causes a variation in the resistance, making it difficult to neutralize the bridge.

An arbitrary index, developed from a logarithmic ratio by Dr. Danziger, indicates the increase or decrease of the impedance angle from the normal. This index, (not to be confused with basal metabolism readings) is used for a comparative basis to demonstrate the progress of the impedance angle tangents of an individual on thyroid therapy.

The impedance angle is independent of the metabolic rate—that is, it is not affected by such conditions as meals, exercise, ordinary medication, size, age or temperature of the patient. The impedance angle appears to be specific for the thyroid factor,

unlike the B M R that is affected by those conditions mentioned plus various diseases, anxiety and others.

Thus it appears to be a more reliable aid than the B M R for differentiating between conditions such as anxiety neurosis and hyperthyroidism, between non-toxic goiters and incipient thyrotoxicosis. It has a definite place for regulating thyroid therapy. As the effect of thyroid extract and thyroxine increases, the impedance angle decreases, giving a reliable index on the course of the treatment. This is substantiated by the increase in the B M R. The attached graph illustrates a striking case.



Because of its limitations the determination of the impedance angle of a patient can never replace the B M R altogether; but where the thyroid factor enters the picture the impedance angle is a definitely reliable diagnostic aid and seems to be more specific than an increase in the basal metabolic rate.

MEN

Dial Readings	0	1	2	3	4	5	6	7	8[4]	9
0.....	....	....	0.244	0.243	0.241	0.239	0.236	0.233	0.230	0.226
	....	....	....	−30	−29	−29	−28	−27	−26	−24
10.....	0.222	0.219	0.215	0.212	0.209	0.206	0.204	0.201	0.198	0.195
	−23	−23	−22	−21	−20	−19	−19	−18	−18	−17
20.....	0.192	0.189	0.186	0.183	0.180	0.177	0.174	0.171	0.168	0.165
	−17	−16	−15	−14	−13	−12	−11	−10	−9	− 9
30.....	0.162	0.160	0.157	0.155	0.152	0.150	0.148	0.145	0.142	0.140
	−8	−7	−6	−5	−5	−4	−3	−2	−1	0
40.....	0.137	0.135	0.132	0.130	0.128	0.125	0.123	0.120	0.118	0.115
	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
50.....	0.113	0.110	0.108	0.105	0.103	0.100	0.098	0.096	0.093	0.090
	+11	+12	+14	+15	+16	+17	+18	+19	+20	+22
60.....	0.088	0.087	0.085	0.084	0.082	0.080	0.078	0.077	0.075	0.074
	+23	+24	+25	+26	+27	+28	+29	+30	+31	+32
70.....	0.073	0.071	0.070	0.069	0.067	0.066	0.065	0.064	0.063	0.061
	+33	+34	+35	+36	+37	+38	....	....	....	....
80.....	0.060	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051
	....	....	....	....	....	....	....	....	....	....

Tangent of Impedance Angle:—Decimal figures.
Arbitrary Index:—Whole numbers designated by plus or minus.

WOMEN

Dial Readings	0	1	2	3	4	5	6	7	8	9
0.....	....	....	0.244	0.243	0.241	0.239	0.236	0.233	0.230	0.226
	....	....	....	−37	−36	−36	−35	−34	−33	−33
10.....	0.222	0.219	0.215	0.212	0.209	0.206	0.204	0.201	0.198	0.195
	−32	−31	−31	−30	−30	−29	−28	−27	−27	−26
20.....	0.192	0.189	0.186	0.183	0.180	0.177	0.174	0.171	0.168	0.165
	−25	−25	−24	−23	−23	−22	−21	−21	−20	−19
30.....	0.162	0.160	0.157	0.155	0.152	0.150	0.148	0.145	0.142	0.140
	−18	−17	−16	−15	−15	−14	−13	−12	−11	−11
40.....	0.137	0.135	0.132	0.130	0.128	0.125	0.123	0.120	0.118	0.115
	−10	−9	−8	−8	−7	−6	−5	−4	−3	−2
50.....	0.113	0.110	0.108	0.105	0.103	0.100	0.098	0.096	0.093	0.090
	−1	0	+1	+2	+3	+4	+5	+6	+7	+8
60.....	0.088	0.087	0.085	0.084	0.082	0.080	0.078	0.077	0.075	0.074
	+9	+10	+11	+12	+13	+14	+15	+16	+17	+18
70.....	0.073	0.071	0.070	0.069	0.067	0.066	0.065	0.064	0.063	0.061
	+19	+20	+21	+22	+23	+24	+25	+26	+27	+28
80.....	0.060	0.059	0.058	0.057	0.056	0.055	0.054	0.053	0.052	0.051
	+29	+30	....	....	....	....	....	....	....	....

Tangent of Impedance Angle:—Decimal figures.
Arbitrary Index:—Whole numbers designated by plus or minus.

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FLASH!

The Department of the Army and the Department of the Air Force are now commissioning qualified women medical technologists in the Medical Service Corps. Applications may be secured by writing the Surgeon General, Department of the Army, Washington 25, D. C., ATT'N: Officer Procurement Branch, Personnel Division. Full details will follow in the November A.J.M.T.

THE GAVEL

How wonderful it would have been if all of you could have been present for our 1950 convention in Houston; each year our conventions seem to be the "ne plus ultra" of desirability; yet each one adds new delights. One of the high-delights of the meetings just past is the inspiration for this column.

In her now-familiar gracious style, and speaking in the name of all our past presidents, Frieda Claussen presented to the Society an exquisite gavel and sounding board. They are made of myrtle wood, which is found "only in the Holy Land and in Oregon." There is a gold band on the gavel on which is inscribed our name. On the sounding board is the list of the donors, all our past presidents, and above that list is this inscription: "With ever-increasing strength and humility, and with the pride and integrity of our profession, let us serve." The inspiration of that inscription coupled with the past examples and present encouragement of the group who gave it, serve the spirit of your new president in the manner that alms serve the poor.

Thus far this year much of the time has been spent in completing the personnel of your committees. Nearly all the vacancies have been filled now, and it is our hope that with the state chairmen of committees helping the members of the corresponding national committees by cooperating in their projects, the year's work will be pleasant and beneficial to us all.

If it seems desirable, this column will appear in each issue of the Journal this year; it will serve as a report to you of the activities of your officers and as a medium through which we may meet and become better friends. Your suggestions, criticisms, or just plain comments concerning the administration of your Society, will be welcomed whole-heartedly. Our purpose is the elevation of our profession; our method is unanimous effort and cooperation. With the latter, the former is assured; and in that assurance rests the futures of us all.

Vernal Johnson

CONSTITUTION AND BY-LAWS CHANGES
1950

At the annual convention of the ASMT, June, 1950, the Board of Directors presented, and the House of Delegates ratified, the following additions and changes in the By-Laws according to the latter portion of Article XII, Section 2, which reads: "The By-Laws may also be amended by a two-thirds majority of the Board of Directors when circumstances require immediate action," etc. (We would suggest that the sections following be substituted in your copy of the By-Laws as they embody the changes as accepted.) The By-Laws as amended now read: Article V, (on page 10)

Section 6. Any motion for the expulsion of any officer of this Society except automatic expulsion for inactivity on the Board of Directors shall be submitted first in confidence (without further divulging the name of the officer) to the President of the Society with a full statement of the prima facie evidence on which the motion is based. The President in conjunction with the two ex-Presidents preceding him most immediately in office shall form a committee with full power to decide whether the motion shall be dropped without further action and without report to the Board of Directors; whether the accused officer shall be allowed to resign without report to the Board of Directors; or whether the motion shall be referred to the Board of Directors. If the motion is referred to the Board of Directors, a unanimous vote of the Board of Directors shall be required to make it final. If any member of the Board of Directors remain inactive for a period of 90 days, the chairman of the Board of Directors, in cooperation with the other Board members, may ask for said member's resignation. This request must be sent by registered mail. If the resignation or a legitimate reason for said member's delinquency is not received within 10 days after the notice has been received, the delinquent member, ipso facto, loses all privileges and duties as a member of the Board of Directors. If by the action of the Board of Directors a vacancy be created in any office, it shall be taken care of as any other such vacancy.

Section 13. The President, President-Elect, and Immediate Past President shall represent the Society as members on the Board of Registry of Medical Technologists of the American Society of Clinical Pathologists.

In Article IX (on page 10)

ARTICLE IX.
Standing Committees

Section 1. There shall be nine (9) standing committees of six (6) members each of such geographical distribution as shall be conducive to effective action. These committees shall be the following: Membership, Constitution and By-Laws, Nominations and Elections, Standards and Studies, Research, Service Fund and Finance, Legislation, Education, and Public Relations.

(on page 14)

Section 12. The Public Relations Committee shall act as a liaison group between the Society and other professional of lay groups, by dispensing information and promoting public understanding of the profession of medical technology.

Section 12 shall be numbered Section 13.

Section 13 shall be numbered Section 14.

Section 14 shall be numbered Section 15.

CONSTITUTION AND BY-LAWS COMMITTEE

The Constitution and By-Laws Committee wishes to remind the membership that all proposed amendments to the Constitution or the By-Laws must be submitted to this committee. This material must reach the committee by January 1, 1951 in order to give the members sufficient time to study carefully and reword, if necessary, to conform with the Constitution and By-Laws and to be published in the March issue of the Journal.

We would like to request that each proposed amendment be accompanied by a discussion of the reasons for the proposal. The committee will attempt to compile and present to the membership the pros and cons for each amendment. We would also like to suggest that each state study these discussions and instruct their delegates accordingly. This would eliminate excessive debate in the House of Delegates.

When Constitutions are to be approved by this committee, 6 copies should be sent. Further information may be found in the By-Laws of this Society—Article I.

Please send your suggestions to the following committee members:

Margaret Haraway, Chairman, 427 Osler Building, Oklahoma City, Oklahoma
Allyne Lawless, 3420 W. 30th Avenue, Denver, Colorado
St. Mary Veronica (Ogden), 305 S. State St., Aberdeen, South Dakota.
Ada Gregory Silor, Lattimore Laboratories, El Dorado, Kansas
Mary Yeaton, 34 Castle Street, Worcester, Massachusetts
John A. Mooty, Lutheran Deaconess Hospital, Beaver Dam, Wisconsin.

LEGISLATION COMMITTEE

The information below will supplement the Legislation Committee report for 1949-50. It is material which has been received by the committee since the report was submitted prior to the convention in June.

Colorado State Society of Medical Technologists, Inc.—Duration: Perpetual. Name protected. There is protection against "class legislation."

Georgia Society of Medical Technologists, Inc. Legislature meets next in January, 1951.

Kansas Society of Medical Technologists, Inc.—Incorporated January 5, 1949. Duration: perpetual.

Maine: State organized in September, 1949. They have not incorporated, but are considering doing so.

Association of Oregon Medical Technologists, Inc.—Incorporated March 22, 1948. Duration: perpetual, non-profit. Legislature meets next in January, 1951.

An error concerning the following organization is corrected below:

Massachusetts Association of Medical Technologists, Inc.—Incorporated October 22, 1945. The legislature meets next in January, 1951. The Massachusetts Medical Association and Pathologists have been most cooperative with the Medical Technologists.

CIVIL SERVICE AND ARMED SERVICES

A bulletin "About the Medical Service Corps," United States Army, lists among the four main allied fields of endeavor, under Medical Allied Sciences: Bacteriology, Parasitology, Biochemistry, and Laboratory Technology, as requiring specialists in those fields. These men are Regular and Reserve Officers in the army. The bulletin states "officer specialists in these and other sciences possess educational qualifications ranging from the bachelor degree to the master degree and a doctorate in the specialty. Contact your nearest recruiting station for further information.

SEROLOGY WORKSHOP

Presented at the ASMT 18th Annual Convention
June, 1950, Houston, Texas
Chairman: Mrs. Phyllis D. Shaw, M.T. (ASCP)
Assisting: Miss Dorothy Patras, M.T. (ASCP)

The Serology Workshop was planned with the hope that ASMT members would benefit from "first hand" information regarding serologic technique. Accordingly, the Author-serologists of the six tests demonstrated were contacted and their enthusiastic response resulted in the selection of qualified representatives who had studied with each Author-serologist in his own laboratory. Antigens and tests were demonstrated as follows:

Kline Test: Mrs. Hazel Suessenguth, Mount Sinai Hospital, Cleveland, Ohio.
Mazzini Test: Miss Virginia Darroch, Florida State Health Department, Miami, Florida.
Kolmer Complement-Fixation Test: Mr. K. C. Knolle, Bureau of Laboratories, Texas State Dept. of Health, Austin, Texas.
Hinton Test: Miss Betty McGrew, Bureau of Laboratories, Texas State Department of Health, Austin, Texas.
Kahn Test: Mrs. Dora Jenkins, 3615 Bluebonnet, Houston, Texas.
V.D.R.L. Test: Mrs. Dorothy Kelly, Fourth Army Area Laboratory, Fort Sam Houston, San Antonio, Texas.

Those who attended the workshop were able to see the actual preparation of antigen emulsions followed by test runs of known positive and negative sera. Proper procedures and interpretation of results were emphasized and it was gratifying to see and hear the "question" and "answer" sessions that took place.

For the benefit of those who needed more detailed information, each representative supplied copies of reprints or mimeographed sheets of the techniques demonstrated. With this up-to-the-minute data, it is believed that the workshop fulfilled its original purpose: to advance further the standardization of serologic technique.

Acknowledgements:
Hermann Hospital, Houston, Texas
W. H. Curtin & Company, Houston, Texas
A. S. Aloe Company, St. Louis, Missouri
Texas State Department of Health, Austin, Texas.
City of Houston Department of Health, Houston, Texas.

AMERICAN ASSOCIATION OF BLOOD BANKS

Third Annual Meeting, October 12-14, 1950
The Stevens, Chicago, Illinois

Among the papers listed on the tentative program for the third annual session of the American Association of Blood Banks which is of special interest to medical technologists are: "The Effect of Proteolytic Enzymes on the Agglutinating Properties of Erythrocytes," by Aaron Kellner, M.D., Emily F. Hedal and Jane M. Haber; "Recent Advances in Cross-matching of Blood for Transfusion," by John Elliott, D.Sc. and James J. Griffitts, M.D.; "The Problem of Incompatible Blood Transfusions on Grouping Reactions," by Don R. Mathieson, M.D.; "The Use of Trypsinated Cells as a Test for Rh Sensitization," by Marion R. Rymer, Ph.D.; "The Use of Trypsinized Cells to Detect Isosensitization in Pregnancy," by A. S. Wiener, M.D.; Confirmatory Tests in Determining Titer of Rh Antibody," by James J. Griffitts, M.D., and "Preparation of Anti-Hemophiliac Globulin," by Quin B. DeMarsh, M.D. The medical technologist would also hear a number of other papers, any of which he could find

somewhat applicable to his work. Nine Panel discussions have been planned for the luncheon periods for Thursday and Friday, with most of the best known names in this field as leaders. Reservations must be made promptly direct with the Stevens Hotel, Chicago, for October 12 through 14, 1950.

The Texas Association of Blood Banks will meet at the Baker Hotel, Dallas, on November 27, 1950.

COMMITTEE ON NOMINATIONS AND ELECTIONS

Letters have been sent by the Nominations and Elections Committee to the affiliated societies of the A.S.M.T. soliciting suggestions for the slate of officers for the next election. As individual members of the society, the committee would appreciate having your ideas and preferences with the qualifications of prospective candidates sent to your state secretaries, who will forward them to this committee. The suggestions may also be sent direct to the committee members.

This is your opportunity to tell us whom you would like to have as officers of your society. Each suggestion will be given careful consideration. Your cooperation is needed NOW. Please may we have your suggestions not later than December 1, 1950.

Offices to be filled: President-elect, Recording Secretary, Treasurer, Board of Directors (two).

NOMINATING COMMITTEE: Mrs. Violetta Wakefield, 1209 North 34th St., Fort Smith, Arkansas, Chairman.

EDUCATION COMMITTEE NOTICE

Your Executive Office has a number of study sets which are available for use in training schools, for seminars or refresher courses, or for loaning to individual members or groups of members. The latest of these sets is concerned with development of erythrocytes and dyscrasias of the erythrocyte series. It includes eleven excellent microscopic slides for demonstration, each accompanied by an explanatory card; thirty-eight lantern slides, twelve of which are color photographs; and a brochure descriptive of the lantern slides and correlated with them.

Your Education Committee has prepared these sets through a great deal of effort and is eager that they be used; we are all grateful to Mary Frances James, of the Medical College of Alabama, for this latest set. We can express that appreciation, while benefiting ourselves, by putting it to the uses for which it was prepared.

This set, or any of the others, may be obtained by writing to the Executive Office, 6544 Fannin Street, Houston 5, Texas, for booking; please give first and second preferences of dates when making the request. When available, the sets will be sent upon receipt of a deposit of $25.00; when the set is returned in good condition, mailing and insurance costs will be deducted and the remainder of the $25.00 refunded.

The smaller sets (20 slides only) are also still available with the $10 deposit ($8.50 refund).

1951 CONVENTION PROGRAM

Helen Madden, Program Chairman, has sent out return cards polling the membership of ASMT through the state presidents for subject material for the 1951 Convention at the New Ocean House, Swampscott, Massachusetts, June 24 through 28. Early notice of your interests in presenting a paper will be appreciated. Please send all suggestions and recommendations in regard to subject matter and possible speakers from this area that you would be interested in hearing, to: Miss Helen Madden, Blood Grouping Laboratory, 300 Longwood Avenue, Boston, Massachusetts.

STATE SOCIETY OFFICERS

1950-51

ARKANSAS: Secretary: Virginia Sparling, Army-Navy Hospital, Hot Springs.

COLORADO: Secretary: Ruth Hagaman, Box 32, Minturn.
Treasurer: Mrs. Louise W. Faulkner, Fitzsimmons General Hospital, Box 6397, Aurora.

FLORIDA: Board of Directors: Eleanor Brenny, 384 Brent Bldg., Pensacola.
Marilyn Thorpe, 911 Citizen's Bldg., Tampa.
Sarah Spears, Riverside Hospital, Jacksonville.

IOWA: President: Marjorie Sharp, 1417 41st St., Des Moines.
President-elect: Lorraine Lawrence, Broadlawns Hospital, Des Moines.
Vice President: Mr. Alfred Carlson, 2134 Rose St., Sioux City.
Secretary: Dorothy Becker, 1700 7th St., Des Moines.
Treasurer: Mr. Clarence Grosz, 1624 37th St., Des Moines.

KANSAS: President: Mrs. Eileen Keller, 905 Tennessee, Lawrence.

KENTUCKY: Vice President: Mr. Allen Edward Crowe, Univ. of Ky. Health Service, Lexington.

MARYLAND: Treasurer: Alice Heckler, 1721 Windemere Ave., Baltimore 18.

MISSOURI: Board of Directors: Emma Mae Baldwin, St. John's Hospital, Springfield.

MISSISSIPPI: Vice President: Mr. Edward G. Michael, Physician's and Surgeon's Clinic, Yazoo City.

VERMONT: President: Mr. Lionel Destremps, 3 South Willard St., Burlington.
Vice President: Mrs. Ruth Bogorad, Hinesburg Road, Burlington.
Secretary: Mrs. Lorraine Purnell, 16 Grant St., Burlington.
Treasurer: Sister Marie de la Ferre, Bishop de Goesbriand Hospital, Burlington.

WEST VIRGINIA: Board of Directors: Betty Jane Watkins, Thomas Memorial Hospital, South Charleston.

WYOMING: President: Billie Kennedy, 320 So. 6th St., Laramie.
Secretary: Roberta Chisholm, Cheyenne. (not on Reg. list).
Treasurer: Jane Smyth, Cross U-Bar Ranch, Big Horn.

Lists of 1950-51 Officers for Delaware, District of Columbia and Washington state, are not available in the Executive Office. See July A.J.M.T. for officers of other state societies.

Arizona, Maine, Rhode Island, and South Carolina remain to organize state societies.

With your cooperation we shall have available to every member of A.S.M.T. a complete and up-to-date list of current state officers through the pages of the Journal. Please see that such information reaches us promptly. The above are additions and corrections for list in July Journal.

ANNUAL CONVENTIONS

ASMT: June 24-28, 1951, New Ocean House, Swampscott, Mass.

ALABAMA SMT: May, 1951. Birmingham.*

ARKANSAS SMT: April, 1951, University Hospital, Little Rock.*

FLORIDA DIVISION ASMT: April 6, 7, 8, 1951, Hotel Soreno, St. Petersburg.

IOWA SMT: May, 1951, Iowa City.*

KANSAS SMT: May 14, 1951, Topeka.*

MASSACHUSETTS AMT: Fall Meeting, Oct. 28, 1950, Salem Hospital, Salem — Symposium on Blood. April, 1951, Springfield.*

MINNESOTA: May, 1951.*

MISSISSIPPI SMT: April, 1951, Jackson.*

MISSOURI SMT: October 28-29, 1950, Springfield.

EMPIRE STATE (NEW YORK) SMT: April 27-29, 1951, Rochester.

NORTH DAKOTA SMT: March or April, 1951, Grand Forks.*

OHIO SMT: Nov. 11, 1950, Hotel Secor, Toledo.

PENNSYLVANIA SMT & LT: Philadelphia.*

TEXAS SMT: April, 1951, Galveston.

WEST VIRGINIA SMT: April, 1951.*

WISCONSIN AMT: Oct. 21-22, 1950, St. Joseph Hospital, Marshfield.

* Further details will appear in a later issue of AJMT.

Assistant laboratory technologist: Opportunity serve internship under registered technologist. $2200 maintenance. Eight hour day; paid annual vacation. 100-bed approved Illinois hospital. (T1108).

Biochemist: Masters degree, experience; take charge biochemistry section of laboratory 300-bed hospital middlewest state capital. 5½ day week. Excellent salary. (T1164).

Bacteriologist-chemist: Take charge office laboratory New York surgeon who is Columbia graduate and member American Board. Salary $50 per week. (T81).

Chief technologist: Female, registered; master's degree. Supervise clinical pathology, organize schedules, order supplies; 300-bed hospital midwest town 300,000. Excellent salary (T1165).

Combination laboratory & x-ray technician: Alaska. $3600 per year. For active group of doctors, adjacent Anchorage, center agricultural experimental region. (T432).

Combination laboratory & x-ray technician: For new ultra modern hospital 25 bed capacity; California town 20,000. Salary to $3600 yearly; living accommodations available. (T454).

Combination x-ray & laboratory technician: Work chiefly in x-ray; have qualified laboratory technician. Modern sixty bed hospital. Southern town 30,000. $3600. (T464).

Head technologist: $3600 maintenance. 100-bed New York hospital, staff of four technicians. Unusually attractive location; new laboratory under construction. (T1140).

Head technologist: ASCP registration or equivalent for medium-sized approved well-equipped hospital fashionable eastern summer resort 30,000. Certified pathologist in charge. (T1078).

Hematologist: Experienced. 125-bed approved hospital; state capital Rocky Mountain region. Minimum salary $3000; one month vacation; forty hour week. (T37).

Laboratory technologist: For well-established clinic having staff of thirty specialists; well-equipped laboratory. Excellent location middlewest university town. 5½ day week. (T1124).

Medical technologist: Registered, degree, experienced; able to teach. 200-bed hospital with approved school for technologists. Eastern state capital and university town. (T1163).

Medical technologist: For 250-bed approved hospital, western university town. Five technicians in department; duties varied including blood bank work. $3000 yearly. (T1150).

Medical technologist: Take charge laboratory small approved, modern hospital. Pleasant, prosperous midwestern community 10,000, adjacent state capital. Starting salary $250 includes maintenance. (T1060).

Medical technologist: To operate private medical clinical laboratory southern state capital. Salary to $4200 yearly. Good hours. (T1168).

Medical technologist: Female, willing to learn x-ray work; good salary plus maintenance. Seventy bed approved general hospital; excellent working conditions. Southeast. (T1189).

Medical technologist: Unusually attractive opportunity in office of well qualified internist, western university town 50,000. 5½ day week; good salary. (T1187).

Medical technologist: Qualified to do all procedures except histology. New 40 bed hospital, Colorado mountain resort town. $3300 yearly. (T1142).

Serologist: Junior serologist for hygienic laboratory, health department southwestern state capital and college town. 90,000 population. Degree required. $250. (T101).

Tissue technologist: Prepare surgical and necropsy tissues, class slides, supervise technicians; multi-hospitals affiliated noted western university with approved technical curricula. Excellent opportunity. (T43).

X-ray and laboratory supervisor: Assume full responsibility for operation both departments. New, ultra modern hospital, eighty beds, congenial residential community 10,000 in southwest. Salary to $500 monthly. (T473).

(We have many other excellent opportunities—please write for complete list—strictly confidential)

WOODWARD MEDICAL PERSONNEL BUREAU

OUR 54th YEAR

185 N. Wabash Ave. ANN WOODWARD, Director Chicago 1, Ill.

Head laboratory technician: South. Registered or eligible. Clinic building is modern-air conditioned. Staff consists of four internists, one who specializes in endocrinology, and one surgeon. Work consists of all routine tests and considerable chemistry and metabolism tests. Located in city of 315,000 with many cultural and recreational advantages. Salary $250-$300. GMT-2812.

X-ray technician: East. 300 bed hospital, fully approved. Require man capable of taking full charge of department after short time. Department is in full charge of a certified Radiologist and nine technicians are employed. This is a wonderful opportunity with unlimited possibilities. $300 to start. GMT-2206.

Laboratory technician: Northwest. 75 bed hospital, fully approved in city of 275,000. 40-hour week—on call about every third night. $250 plus maintenance. GMT-2288.

Head x-ray technician: Middle West. Private clinic. Full charge of department; 3 technicians and one dark room technician. Clinic has own 100 bed hospital. Excellent salary depending on qualifications. GMT-2408.

Chief laboratory technician: West. Full charge of laboratory in famous clinic with national reputation. Bacteriology training especially valuable as they wish to do more of this type of work. Research encouraged and given financial support. Laboratory completely modern and well staffed. $400 to start. GMT-2355.

Laboratory technician: Southwest. 200 bed hospital. 7 technicians are employed. This is an excellent opportunity. Laboratory completely modern. $300 to start. GMT-2845.

Laboratory technician: West. Large tuberculosis sanitarium. Bacteriological experience would be helpful. Laboratory modern and well equipped. $300. GMT-2843.

Medical technologist: West. Must be registered ASCP. 100 bed hospital located in beautiful mountainous resort area. Ideal climate, many recreational facilities. $300-$350. GMT-2880.

Head laboratory technician: Middle West. Registered or eligible. Duties strictly administrative. Well equipped laboratory; 200 bed hospital, fully approved and located in city of 31,000. Excellent medical staff. $300. GMT-2881.

Laboratory technician: Chicago, 100 bed hospital, easily accessible to Chicago's loop. Staff is excellent and working conditions very good. $300. GMT-2651.

2 laboratory technicians: Middle West. Private laboratory located in city of 90,000. 44 hour week, no night or week-end calls. Technicians must have good experience in either bacteriology or chemistry. Excellent chance for advancement. $250-$325. GMT-2870.

Medical technologist: B.S. Degree in chemistry or bacteriology. 140 bed hospital located in middle western city of 20,000 in heart of summer resort area. Definite opportunity to assume full charge of laboratory if capable. Top salary plus maintenance. GMT-2469.

Laboratory technician: East. Must be registered—prefer training in clinical chemistry. 250 bed hospital, fully approved. Ideally located in picturesque New England city of 70,000. $300. GMT-2251.

Laboratory technician: East. 185 bed hospital needs well trained technician with experience in clinical laboratory with emphasis on chemistry, bacteriology and operation of blood bank. $275 plus maintenance. GMT-2180.

Chief laboratory technician: South. B.S. Degree and registered with ASCP, plus good experience in general hospital laboratories. 275 bed hospital, fully approved. $300 plus maintenance. GMT-2228.

X-ray-laboratory technician: Southwest. 150 bed hospital in city of 250,000. Building program in progress which will bring total capacity of hospital to 300. Require good experience in both clinical laboratory and x-ray procedures. GMT-2411.

SHAY MEDICAL AGENCY

55 East Washington Street BLANCHE L. SHAY, Director Chicago 2, Illinois

Please Mention Publication When Writing